The Biological Assessment for the Southeast Alaska Salmon Fishery for 1997-2003 Under Section 7 of the Federal Endangered Species Act

by Norma Jean Sands and J. P. Koenings

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ACRONYMS

ADF&G	Alaska Department of Fish and Game
AEQ	Adult Equivalent (number of salmon after taking into consideration natural mortality)
Board	The Alaska Board of Fisheries
BY	Brood Year
CNR	Chinook Nonrentention
CTC	Chinook Technical Committee
CWT	Coded Wire Tag
EEZ	Economic Exclusive Zone
ESA	Endangered Species Act
ESU	Ecological Significant Unit (as defined by ESA)
FMP	Fisheries Management Plan (of the NPFMC)
LOA	Letter of Agreement (by U.S. PSC Commissioners regarding management of SEAK chinook fishery)
MMPA	Marine Mammal Protection Act
MSY	Maximum Sustainable Yield
NMFS	National Marine Fisheries Service
NPFMC	North Pacific Fisheries Management Council
PFMC	Pacific Fisheries Management Council
PSMFC	Pacific States Marine Fisheries Commission
PSC	Pacific Salmon Commission
PST	Pacific Salmon Treaty
SEAK	Southeast Alaska

INTRODUCTION

This report provides the biological assessment of listed species and potential listings in the Southeast Alaska (SEAK) salmon fishery for 1997-2003 as required under Section 7 of the Federal Endangered Species Act (ESA). To date, there have been four biological opinions by the National Marine Fisheries Service (NMFS) that the SEAK salmon fishery "is not likely to jeopardize the continued existence of any endangered or threatened Snake River salmon species" (NMFS 1993,1994b, 1995c, 1996c) . These opinions covered the fishing periods from the 1992/1993 winter fishery through the 1996/1997 winter fishery.

While there are some 20 or more listed or potential ESA species, most of them salmon stocks, that may occur in the waters off Southeast Alaska, only the Snake River fall chinook salmon are impacted by the SEAK fishery to the extent that they can be estimated and monitored. In order for a salmon stock to be considered a species under ESA, it must represent an Evolutionary Significant Unit (ESU) of the biological species as identified by NMFS (56 FR 58612; Waples 1991). Other listed ESA species and proposed or potential species/stocks/ESUs for listing under the ESA that are found in the eastern North Pacific Ocean are discussed briefly in the next section. The listed and proposed ESA species, other than Snake River fall chinook salmon, have been determined not to be impacted by the SEAK salmon fishery, either because the animal populations in question are not present in waters off the coast of Alaska at the time the SEAK fishery occurs, or because they are not taken incidentally in the SEAK fishery. Coastal salmon stocks, in general, are under review by NMFS to assess their status and potential for listing under ESA; until the ESUs are identified and their status identified, it is futile to determine impact by the SEAK fishery. However, the potential for listing additional salmon stocks that are significantly impacted by the SEAK fishery is thought to be low.

The SEAK fishery is managed by the Alaska Department of Fish and Game (ADF&G) under the auspices of the North Pacific Fisheries Management Council (NPFMC). The fishery is also governed by negotiated agreements within the Pacific Salmon Commission (PSC). The chinook conservation and management plan for the SEAK fishery for 1997-2003 that is presented here is based on the 'Letter of Agreement Regarding an Abundance-Based Approach to Managing Chinook Salmon Fisheries in Southeast Alaska' (LOA) reached by the U.S. Commissioners of the PSC (Allen et al. 1996 and Attachment 1 of this document) in absence of a bilateral agreement for chinook salmon. The LOA presents a significant development in the U.S. Section of the Pacific Salmon Commission; besides establishing a foundation for bilateral negotiations with Canada, the agreement was developed for the purposes of:

> *"(b) clarify the role of the SEAK and other fisheries in rebuilding depressed naturally spawning chinook stocks and sustaining them at healthy levels; and (c) providing a means for sharing the harvest and the conservation responsibility for far-north-migrating chinook stocks originating south of the Washington-Canada border."*

The LOA is to be followed until the year 2003 or until it is renegotiated by the U.S. Commissioners or modified by a bilaterally agreed Pacific Salmon Treaty (PST) annex for chinook salmon. The State of Alaska, therefore, is requesting that this biological assessment, as

part of the consultation process under Section 7 of ESA, results in a determination by the NMFS that the SEAK fishery is not likely to jeopardize either the continued existence or potential recovery of listed species for the 1997-2003 period.

STATUS OF ESA SPECIES AND IMPACT BY THE SOUTHEAST ALASKA FISHERY

The following is an annotated list of listed ESA species, including potential candidates for listing, that occur or have the potential to occur in SEAK waters; this includes two marine mammal species and several salmon ESUs. A brief description of each ESA species and the affect of SEAK fishery on its continued existence and potential for recovery is included.

LISTED SPECIES

Snake River fall chinook salmon (*Oncorhynchus tshawytscha*)

[threatened April 22, 1992, 57 FR 14653; endangered, August 18, 1994, 59 FR 42529; threatened April 17, 1995, 60 FR 19342].

A description of this chinook salmon stock has been summarized by the NMFS in "Listed species, critical habitat, biological requirements, and status under environmental baseline in 1995" (NMFS 1995b) which is also Attachment 1 to Alaska's 1996 Section 7 Consultation (NMFS 1996c), and is briefly summarized here.

Snake River fall chinook salmon are part of the Columbia Upriver Bright stock complex of fall run chinook salmon. In general, spawning occurs from October through November and fry emerge from March through April. Downstream migration is thought to begin within weeks of emergence; the fry rear in backwaters and shallow water areas of the Columbia River prior to smolting and migration to the ocean in late summer. They spend from one to four years maturing in the ocean before beginning their spawning migration. Adult Snake River fall chinook salmon enter the Columbia River in July and migrate into the Snake River from mid-August through October [56 FR 29548] (p.6 NMFS 1995b). Chinook salmon arriving at Bonneville Dam on the Columbia River starting August 1 and at Ice Harbor Dam at the mouth of the Snake River starting August 12 are considered fall chinook salmon (Glen Mendel, Snake River Lab, Washington Department of Fisheries and Wildlife, pers. comm. 1996) (see Figure 1).

Spawning areas for the Snake River fall chinook salmon were historically much more extensive within the Snake River and its tributaries than in recent years (Figure 1). Construction of 12 dams[1] on the mainstem Snake River and 7 dams on tributaries to the

[1] From the mouth of the Snake River going towards the head waters, the dams are: Ice Harbor (1961), Lower Monumental (1969), Little Goose (1970) , Lower Granite (1975), Hells Canyon (1967), Oxbow, Brownlee (1961), Swan Falls (1901), Upper Salmon Falls, Milner, Minidoka, and American Falls. There are another 7 dams on tributaries to the Snake River.

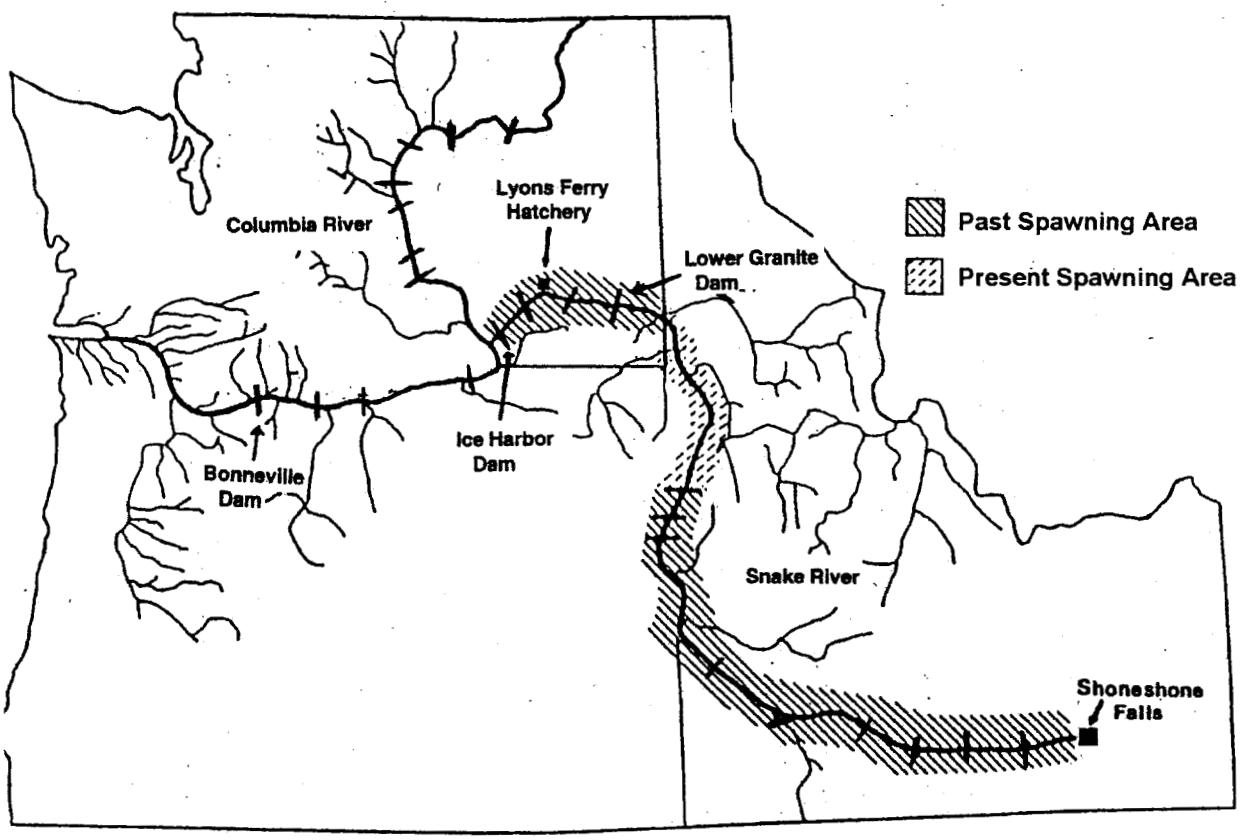

Figure 1. Location of Bonneville Dam on the Columbia River and Ice Harbor Dam, Lower Granite Dam, and Lyons Ferry Hatchery on the Snake River. Present and past spawning areas for fall chinook salmon on the mainstem Snake River are also indicated.

Snake River substantially reduced Snake River salmon spawning and rearing areas, distribution, and abundance, particularly for fall chinook salmon (Horner and Bjornn 1979, NMFS 1995a). Huge production areas for salmon spawning in the upper Snake River Basin were eliminated by the completion of the Hells Canyon dam complex in 1967, as these dams were designed and constructed without fish passage facilities. Other important spawning and rearing areas in the lower portion of the river were inundated by reservoirs leaving only about 100 miles of spawning area between Hells Canyon Dam and the reservoir above Lower Granite Dam (Figure 1).

There are no direct measures of the ocean migration routes of naturally spawning Snake River fall chinook salmon. Coded-wire tagged (CWTed), subyearling releases of fall chinook salmon from Lyons Ferry Hatchery have been used as an indicator stock for representing the migratory movement of naturally spawning Snake River fall chinook salmon (Clark et al. 1995; CTC 1994, 1996).

Adult Lyons Ferry Hatchery chinook salmon are caught in the fisheries of SEAK, North/Central British Columbia (Canada), west coast of Vancouver Island (Canada), and Washington State with troll, net and sport gear. Based on occurrence of the hatchery stock,

SEAK waters are considered the far north extreme of the range for Snake River fall chinook salmon and it is likely that a large portion of the stock is not available for harvest by the SEAK fishery. However, small numbers are assumed to be taken incidentally while fishing for healthy stocks of chinook and coho salmon in SEAK waters.

The incidental take of Snake River fall chinook salmon in the SEAK fishery, as managed under the PST and Alaskan regulations, has not adversely affected this listed population, as opinioned in four previous Section 7 consultations with NMFS for the SEAK fishery (NMFS 1993, 1994b, 1995c, 1996c). In these four biological opinions, NMFS concluded that the SEAK fishery does not jeopardize the existence or the potential for recovery of Snake River fall chinook salmon and granted the incidental take in the SEAK fishery.

Critical habitat was designated for the three Snake River listed salmon populations (fall chinook, spring/summer chinook, and sockeye) on December 28, 1993, [58 FR 68543] effective on January 27, 1994. The essential features of the critical habitat of Snake River salmon have been defined to include four components: 1) spawning and juvenile rearing areas, 2) juvenile migration corridors, 3) areas for growth and development to adulthood, and 4) adult migration corridors. The oceanic habitat of Snake River salmon, including SEAK waters, is not designated as critical habitat.

Snake River spring/summer chinook salmon (*O. tshawytscha*)

[threatened April 22, 1992, 57 14653; endangered, August 18, 1994, 59 FR 42529; threatened April 17, 1995, 60 FR 19342].

Snake River spring/summer chinook salmon (unlike the Snake River fall chinook) are stream-type salmon; they rear for one year in fresh water before entering the sea, have extensive offshore oceanic migrations, and return to their natal river in the spring or summer, several months before spawning. Upstream migrating adult spring and summer chinook salmon pass Bonneville Dam from March through May and in June and July, respectively [56 FR 29542].

Little is known about the life history of Snake River spring/summer chinook salmon during their ocean residence, since these fish do not contribute in appreciable numbers to any known ocean fishery (NMFS 1995a). Over four million CWTed spring/summer chinook salmon from the Snake River basin have been released over a 12+ year period and, up to 1995, only 31 CWTs have been recovered in ocean fisheries (all from Canada, Washington, and Oregon) compared to 817 CWT recoveries in inriver fisheries and escapements (NMFS 1996b). No CWTs from Snake River spring/summer chinook salmon have been recovered in the SEAK fishery despite high juvenile tagging rates, high landed catch sampling rates in the SEAK troll fishery (35-40%), and longer fishing seasons during the first few years of CWTed-fish returns. NMFS concluded in four previous Section 7 biological opinions (NMFS 1993, 1994b, 1995c, 1996c) that the probability that Snake River spring/summer chinook salmon are incidentally harvested in the SEAK fishery is virtually zero.

Therefore, the SEAK fishery does not impact this listed population.

Snake River sockeye salmon (*Oncorhynchus nerka*)

[endangered, November 20, 1991, 57 FR 58619].

Snake River sockeye juveniles rear in lake systems for one or, more rarely, two years before smolting and beginning their down stream migration to the ocean. Historically, they spawned in three different lake systems; today there is production, and very limited at that, from only one lake, Redfish Lake in the Stanley Basin system. Snake River sockeye salmon will typically spend two to three years in the Pacific Ocean before returning to spawn in their fourth or fifth year of life. They enter the Columbia River primarily during June and July for the start of their upriver spawning migration, entering the Snake River from Mid-July through August. Spawning occurs in the fall from September through November.

As with Snake River spring/summer chinook salmon, little is known about the life history of Snake River sockeye salmon during their ocean residence, since these fish do not contribute in appreciable numbers to any known ocean fishery, including the SEAK fishery (NMFS 1995b, PFMC 1993). They probably do not migrate as far north as SEAK waters. Even if some did migrate this far north, their early migration timing back to the Columbia River precludes their presence in the SEAK fishery. Sockeye harvest in SEAK is directed at mature sockeye and does not begin until late June and July (Clark et al. 1995), at which time Snake River sockeye salmon are already migrating into the Columbia River. NMFS (1996c) concluded in their 1996 Section 7 biological opinion for the SEAK fishery that "the probability that a Snake River sockeye salmon would be incidentally harvested in the SEAK fisheries is therefore virtually zero."

Therefore, the SEAK fishery does not impact this listed population.

Sacramento River winter-run chinook salmon (*O. tshawytscha*)

[endangered, January 4, 1994, 59 FR 440].

The impacts of ocean fisheries along the Pacific coast on these winter-run chinook salmon were considered in the March 8, 1996, opinion concerning Pacific Fisheries Management Council (PFMC) fisheries (NMFS 1996b). There is no indication that Sacramento River winter-run chinook salmon migrate as far north as SEAK waters and, therefore, it is unlikely any are caught in the SEAK fishery.

Therefore, the SEAK fishery does not impact this listed stock group.

Central California coastal coho salmon (*Oncorhynchus kisutch)*

[threatened, October 31, 1996, 61 FR 56138].

The central California coast coho ESU has been defined and listed as threatened and includes all native, naturally reproducing coho salmon in approximately nine major river basins from

Punta Gorda in northern California to the San Lorenzo River in Santa Cruz. Marine harvest of these coho salmon occurs primarily in nearshore waters of British Columbia (Canada) and the States of Washington, Oregon, and California [61 FR 56142]. CWTs from naturally spawning or hatchery coho stocks of California origin have not been recovered in SEAK waters.

Therefore, the SEAK fishery does not impact this listed stock group.

Humpback whale (Megaptera novaeangliae)

[endangered, classified as such in 1973 when the ESA was passed].

The humpback whale first received protection in the North Pacific after the 1965 hunting season; it was classified as endangered when the U.S. ESA was passed in 1973 and remains so today. No critical habitat designation has been made for the humpback whale. The salmon fishery in SEAK is commonly promulgated in the presence or near vicinities of feeding humpback whales; however, it is quite rare for vessels or fishing gear to touch or otherwise come in direct contact with whales. Over the years there have been rare instances of a whale becoming entangled temporarily in a gillnet; in those incidents the whale escaped, presumably unharmed.

Therefore, the SEAK fishery does not impact this listed species.

Steller sea lion (*Eumetopias jubatus*)

[threatened April 5, 1990, 55 FR 12645 and, final rule, November 26, 1990, 55 FR 49204].

Stellar sea lions were listed as threatened throughout their range by emergency interim rule April 5, 1990, and in final rule November 26, 1990. Critical habitat was designated August 27, 1993 [58 FR 45269]. Revision of the listing to divide the western and eastern populations and redesignate the western population as endangered is underway. The eastern population will remain in threatened status. Designated critical habitat in SEAK waters include nearshore habitats around rookeries and haulouts. Fishing activities do not result in any destruction or adverse modification of Steller sea lion critical habitat.

Steller sea lions are very rarely taken during fishing activities. Entanglement during net fisheries occurs and rarely results in mortality. Entanglement of marine mammals must be reported to the NMFS and individual fishermen must register with NMFS and receive annual authorization under the Marine Mammal Protection Act (MMPA). Shooting or otherwise deterring marine mammals from potential acts of depredation is prohibited under the MMPA. In the troll fishery, Steller sea lions occasionally take a baited hook or salmon that is already hooked and being reeled in, but due to their size and physical abilities, the Steller generally frees itself without injury. These depredation acts are an annoyance to fishermen, but are not considered a threat to Steller sea lions.

Therefore, the SEAK fishery does not impact this listed species.

POTENTIAL LISTINGS

California/Oregon coastal coho salmon (*Oncorhynchus kisutch)*

[proposed October 31, 1996, 61 FR 56211].

Oregon coastal (from Cape Blanco to Columbia River) and southern Oregon/northern California coastal (from Punta Gorda, CA, to Cape Blanco, OR) coho ESUs have been defined by NMFS and are under consideration to be listed as threatened. The new deadline for final action on the proposed listing of the Oregon Coastal and the Southern Oregon/Northern California Coastal ESUs of coho salmon is April 25, 1997.

No CWTs from naturally spawning or hatchery coho stocks from southern Oregon or California have been recovered in SEAK waters. Only a few CWTs from Oregon coast hatchery releases[2] have been recovered in SEAK waters and these were all from the 1985-1989 period. Three of these hatcheries are situated in the Oregon coast ESU area and one (Butte Falls) is from the southern Oregon area, although the brood stock and release site were from the Coos River in the southern part of the Oregon coast ESU area. No hatchery stocks have been identified as indicator stocks of the naturally spawning ESUs, so it is not known whether any of these recoveries even represent the ESU. Since 1989, no CWT recoveries have been made in SEAK catches from any Oregon or California coastal coho stock.

Therefore, the SEAK fishery does not impact the Oregon and California coastal coho stocks.

Washington/Oregon/Idaho/California steelhead trout (*Oncorhynchus mykiss*)

[5 ESUs proposed endangered and 5 threatened, August 9, 1996, 61 FR 41541].

NMFS has issued a proposed rule to list four steelhead trout stocks from California and one from Washington (Upper Columbia River) as endangered, and to list five trout stocks, Snake River Basin, Lower Columbia River, Oregon Coast, Klamath Mountains Province, and Northern California, as threatened. Southern U.S. steelhead trout are not thought to consistently migrate as far north as SEAK waters. During the period 1982-1993, when the SEAK seine landings were sampled for CWTed steelhead, only around one tag per year was recovered, although tag releases of steelhead in the southern states was quite high.

Sampling for CWTed steelhead in SEAK landings was discontinued in 1994 when it became illegal for purse seiners to sell steelhead. Beginning in 1997, selling of steelhead in SEAK is not allowed for any gear group. No CWTed steelhead from Washington, Oregon, Idaho, or California have been recovered in the SEAK fishery after 1992 by volunteer or any other type of recovery.

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[2] Tresk River Hatchery (1 in 1985), Fall Creek Hatchery (1 in 1986), Butte Falls Hatchery (1 in 1987 and 4 in 1989), and Nehaelm Hatchery (1 in 1988).

Therefore, the SEAK fishery does not impact these steelhead trout stocks.

Washington/Oregon/Idaho/California pink, chum, sockeye and chinook salmon and cutthroat trout.

Coastwide reviews under the ESA are being conducted by NMFS for salmon and trout species, with the potential of identifying and listing some endangered or threatened ESUs. Southern U.S. (WA, OR, CA, ID) pink, chum, and sockeye salmon, and cutthroat trout are not thought to migrate north into SEAK waters. Southern coastal chinook salmon that are far-north migrating, other than that already listed, are relatively healthy; however, the potential remains of identifying ESUs that migrate into SEAK waters and are caught in the SEAK fishery.

Given the present state of knowledge of distribution of WA/OR/CA/ID pink, chum, and sockeye salmon and cutthroat trout, the SEAK fishery is thought not to impact these stocks. Given the lack of identification of chinook ESUs and indicator stocks, predictions cannot be made as to the extent of SEAK harvest of these stocks; however, given the new abundance based harvest rate regime for the SEAK chinook fishery which keeps harvest down when stocks are low, the SEAK fishery is thought not to significantly impact any of these WA/OR/CA/ID chinook stocks with potential for ESA listing.

THE SOUTHEAST ALASKA SALMON FISHERY

BACKGROUND

The salmon fishery in SEAK occurs annually from the international boundary at Dixon Entrance in the south to the longitude of Cape Suckling (143°53'36"W) in the north, including the Exclusive Economic Zone (EEZ) and state waters. The fishery includes commercial, sport, personal-use, and subsistence fishing. The fishery is managed by the ADF&G under the Fisheries Management Plan (FMP) from the NPFMC and is only open to license or permit holders; licenses and permits are issued by the State of Alaska to individuals, both residents and nonresidents of the State of Alaska.

The constitution of the State of Alaska mandates that Alaska's fishery resources be managed on a sustainable yield basis, while specific regulations are developed through the Alaska Board of Fisheries (Board) process and through renegotiation of annex provisions within the PST. The chinook fishery in SEAK has been managed for conservation and rebuilding of stocks since 1981 under the oversight responsibilities of the NPFMC; this was three years prior to the start of the PST chinook rebuilding program. For the past four years, the incidental take of listed salmon has been covered under ESA Section 7 consultations conducted by NMFS.

From the time of statehood in 1959 to the present, ADF&G has managed the SEAK salmon fishery in both state waters, where the majority of the chinook fishery takes place, and in the federal waters of the EEZ. Under the FMP, the director of the Alaska Region of NMFS reviews ADF&G annual management plans to ensure consistency with the FMP, the Magnuson-Stevens Fisheries Conservation and Management Act (formally the Magnuson Fisheries Conservation and Management Act), and the PST, and reports his or her findings to the NPFMC. The NPFMC retains the option of specifying management measures applicable to the EEZ that differ from those of the State if it determines the ADF&G proposed actions to be inconsistent with the Magnuson-Stevens Act or other federal law. To date, the NPFMC has never exercised that option, but has consistently deferred management of the commercial troll and recreational salmon fishery in the EEZ off the coast of Alaska to the ADF&G.

The Board considers fishery management plans for the SEAK region on a three-year rotational basis. Board regulations generally deal with conservation and allocation issues, gear limitations, etc., and ensures that its regulations are consistent with PST provisions. The current management plans for the SEAK fishery, adopted in 1994, are reported in regulation booklets, published separately for commercial fisheries (ADF&G 1994a), sport fishing (ADF&G 1996a) and subsistence and personal use fisheries (ADF&G 1996b). In addition to these regulation booklets, ADF&G publishes annual regulatory guides which provide updated information on fishery regulations. In addition to the regulations found in these booklets and guides, ADF&G

may promulgate inseason emergency orders as required to implement Board regulations and to ensure conservation of salmon stocks.

In previous years, catch ceilings have been determined through the U.S./Canada PST annex renegotiations. For the past several years there have been no bilateral annex agreements for specifying catch ceilings for chinook salmon; annual SEAK harvests have been equal to or below the previously agreed ceiling of 263,000 chinook salmon. In 1996 the U.S. Commissioners came to an agreement on a chinook management plan for SEAK fishery; this agreement is expressed in a letter of agreement (LOA) (Allen et al. 1996). This plan is consistent with Board regulations and is the all-gear chinook management plan ADF&G will follow through 2003, unless modified by either the U.S. Commissioners or the bilateral Treaty process.

Commercial Fishery

The commercial fishery consists of troll, drift gillnet, set gillnet, and seine fisheries. Fishermen are required to hold a gear-specific fishing permit which is good for all areas open for that gear within Southeast Alaska. Salmon permits are "limited entry" permits and must be obtained by transfer from a current permit holder. The current number of permits per gear type are given in Table 1. Limited-entry permits do not have to be fished every year; however, the annual renewal fee must be paid each year in order to keep the permit valid. If renewal fees are not paid for two years, the permit may be forfeited to the State. Forfeited limited entry permits are removed from the fisheries. In addition, any vessel that is used in a commercial fishery must be registered with ADF&G for that gear type. Starting in 1997, sport fishing for salmon is permitted from registered troll vessels, but only after 3 days following closure of the commercial season. A vessel may register as both a commercial troll and charter boat vessel, but may not engage in both activities on the same day.

Most (>85%) of the purse seine, drift gillnet, set gillnet, and power troll permits are fished each year, while only around 40% of the hand troll permits might be fished in any given year. About 70% of the gillnet and 85% of the troll permit holders are Alaska residents; over half (57%) of the purse seine permit holders are non-Alaska residents (mostly from Washington State).

Table 1. Number of fishing permits for the SEAK fishery by gear type; both number of valid permits and the number of fished permits. Not all permits are fished each year. Set nets are only allowed in the Yakutat area. Data from the Commercial Fisheries Entry Commission.

	Number of Permits		
	Valid	(average 1990-94)	
Gear	in 1996	Valid	Fished
set gillnet	164	169	157
drift gillnet	483	484	461
purse seine	417	419	374
hand troll	1,513	1,700	649
power troll	955	956	833

The catch of chinook salmon is regulated by the PST and includes a ceiling for "treaty chinook" (coastwide stocks plus a base level harvest of 5,000 Alaska hatchery chinook plus a management risk factor), the Alaska hatchery add-on (all Alaska hatchery fish above the base level and risk factor), and, starting in 1996, catch in terminal exclusion areas.

Most of the chinook catch in SEAK is taken in the troll fishery. By Board regulation (1997), the set gillnet and drift gillnet fisheries are limited to 8,600 treaty chinook salmon and the purse seine fishery is limited to 4.3% of the aggregate all-gear treaty chinook allowable catch as determined by the PSC process (i.e., LOA) [FB 5AAC 33 365]. In the net fisheries, chinook salmon are taken incidentally in targeting other species. Alaska hatchery chinook salmon taken in net fisheries are not counted within the treaty quota. Of the treaty chinook salmon remaining from the PST allowable catch after the net fishery allocations, 80 percent goes to the troll fishery and 20 percent to the sport fishery. These new Board regulations for the net fishery chinook allocation result in similar levels of permitted harvest as occurred under the old regulations at a PST all-gear ceiling of 263,000 chinook salmon.

The net fishery occurs from mid-June to early October. The purse seine catches consist mostly of pink and chum salmon. The gillnet catches consist mostly of sockeye, chum, and pink salmon in the summer and coho and chum salmon in the fall. Generally, most of the chinook salmon caught in net fisheries are from the purse seine fishery. ADF&G may use chinook nonretention regulations for the purse seine fisheries and/or night closures for the gillnet fisheries (nonretention for the gillnet fishery may provide little benefit as an unknown number of gillnetted salmon can be released alive). Nonretention periods for the purse seine fishery occur most years, while night closures for gillnet fisheries are rare.

The troll fishery has two seasons, the winter season, October 11-April 14, and the summer season, April 15-September 30. The winter season generally has the lower fishing effort and is open throughout the period. Historically, as more restrictions were placed on the summer fishery, catches in the winter season increased. A catch limit for the winter fishery has recently been defined by Board regulation at 45,000 chinook salmon; this level of harvest has not been reached since it was instituted. The winter troll fishery is limited to within the surfline. Landed chinook salmon must measure at least 28 inches; undersized chinook salmon must be returned to the water without injury.

Sport Fishery

To sport fish in Alaska, one must have a valid State of Alaska sport fishing license; licenses are required annually. All anglers sport fishing for chinook salmon must purchase a current year's special salmon tag for chinook salmon. Sport fishing may be conducted only by use of a single line attached to a rod or pole and having not more than one plug, spoon, spinner, or series of spinners, or two flies, or two hooks. The line must be closely attended. The number of poles on a charter vessels are limited to the number of clients onboard. Bag limits for chinook salmon generally are 2 daily, 2 in possession and there is a 28-inch minimum size. In 1997 a season bag limit was implemented for nonresident sport fishers of 4 chinook salmon.

In compliance with Board regulations, ADF&G manages the SEAK chinook salmon sport fishery in marine waters such that it harvests not more than 20 percent of an allowable sport/troll treaty chinook catch determined by subtracting the commercial net allocations from the all-gear catch ceiling specified by the PST process. Annual sport catches are given in Table 2. ADF&G uses preseason and inseason estimates of the treaty chinook catch to modify sport fishing regulations in order to not exceed the allocation quota for a given year.

The objectives of the sport fishing management plan are to allow uninterrupted sport fishing for chinook salmon in marine waters, while not exceeding the allocation harvest, and to minimize regulatory restrictions on anglers not fishing from a charter vessel. If it appears that the sport catch of chinook salmon will exceed the allocation, ADF&G may reduce the bag and possession limits, increase the minimum size, and/or introduce area closures. Special restrictions for charter vessel fishing may also be used as needed, such as prohibiting down riggers, nonretention by charter vessel operators and crew, and reducing bag and possession limits (see the 1996 Southeast Alaska Sport Fishing Regulations Summary, ADF&G 1996a).

Subsistence and Personal Use Fishery

The general taking of salmon for subsistence and personal use purposes is regulated and only Alaskan residents are allowed to participate (ADF&G 1966b). A valid subsistence or personal use fishing permit issued by the ADF&G Commissioner, or his local representative, and a valid sport fishing license for personal use fishing are required for salmon unless the fisherman is retaining salmon from his/her legally obtained commercial catch for personal use. Catch reports must be completed on forms provided by ADF&G and submitted to the department office from which the permit was issued. General subsistence permits are not allowed for chinook salmon. However, in the Taku River only, chinook salmon taken incidentally while legally subsistence or personal-use fishing may be retained; these fish must be reported on the catch records of the permit holder.

PAST CONSERVATION EFFORTS

Management action to minimize impacts of the SEAK fishery on depressed chinook stocks started in the early 1980s with the ADF&G and NPFMC rebuilding program for chinook salmon stocks. Prior to 1980, the troll fishery was open to chinook salmon retention the entire calendar year. Due to concerns about reduced chinook abundance coastwide, a chinook rebuilding program was initiated in Southeast Alaska in 1981, with catch ceilings being introduced in 1980. In 1981 a spring closure of 30 days (April 15 - May 14) and a fall closure of 10 days (Sept. 21-30) were implemented with additional closures determined inseason to maintain catch levels within the guide line harvest levels. The spring closures allow migrating chinook salmon heading for spawning grounds in the north (spring stocks) and the south (fall stocks) to pass through SEAK waters. In 1984 the spring closure was extended into early June and in 1988 it was extended until the end of June, allowing for limited hatchery access fisheries in June. Thus, in the 1980s, Alaska introduced temporal conservation measures to protect south migrating

stocks of chinook salmon; this would include Snake River fall chinook salmon which would be passing through SEAK waters in the spring to enter the Columbia River in July and August.

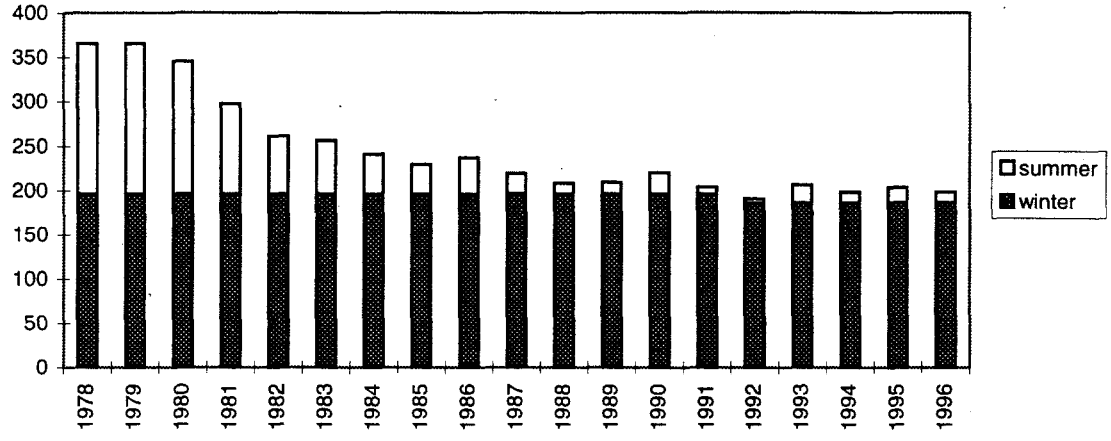

Figure 2. Number of days the SEAK troll fishery was open to chinook fishing by year from 1978-1996.

The number of days the SEAK fishery has been open each year is graphically presented in Figure 2. The winter fisheries saw a slight reduction in days starting in 1992 when its opening was delayed by 10 days; while the summer fisheries experienced a marked drop in the number of days open from 1980 to 1988. To maintain coho-directed troll fishing during the summer, chinook nonretention (CNR) fisheries are allowed. In order to reduce incidental mortality on chinook salmon, areas of high chinook concentration are closed during CNR fisheries. on chinook salmon, areas of high chinook concentration are closed during CNR fisheries.

Starting in 1985 as part of the U.S./Canada Salmon Treaty, the SEAK fishery and three Canadian fisheries were managed under set ceilings as part of the coastwide chinook rebuilding plan. The 263,000 chinook harvest ceiling for the SEAK fishery existed until recently with only slight modifications. In recent years, in the absence of an agreement on Treaty catch ceilings, the harvest levels have been set by ADF&G below 263,000 chinook salmon. Starting in 1997 a new abundance-based management regime will be used; this new management plan is described in detail below.

THE ANNUAL AGGREGATE CHINOOK CATCHES

Annual chinook catches in the SEAK fishery for 1979-1996 are given in Table 2. Pre-1985, these represent total catches; post-1985, treaty catches (i.e., total catches minus hatchery add-on and terminal exclusion catches).

Table 2. Annual chinook catches by gear group in the SEAK fishery and the corresponding ceiling or target harvest level. For the years 1979-1984, the catches (in *italics*) represent total landed catch, and for the years 1985-1996 (years under the PST), the catches represent treaty catches (landed catches minus hatchery add-on and terminal exclusion). Catch numbers for 1996 are preliminary.

	Chinook Catch				Ceiling or
Year	**Troll**	**Net**	**Sport**	**Total[a]**	**Target Harvest**
1979	*334,306*	*28,465*	*16,581*	*379,342*	None
1980	*303,885*	*20,114*	*20,213*	*344,212*	286,000-320,000
1981	*248,791*	*18,951*	*21,300*	*289,042*	243,000-286,000
1982	*242,315*	*48,999*	*25,756*	*317,070*	243,000-286,000
1983	*269,790*	*19,655*	*22,321*	*311,766*	243,000-272,000
1984	*235,629*	*32,398*	*22,050*	*290,077*	243,000-272,000
1985	212,166	34,168	23,031	269,365	263,000
1986	231,590	20,483	19,185	271,258	254,000
1987	231,025	13,952	20,454	265,431	263,000
1988	217,075	17,443	22,248	256,766	263,000
1989	222,924	18,486	26,678	268,088	263,000
1990	263,574	16,100	41,360	321,034	302,000
1991	231,616	19,977	45,130	296,723	273,000
1992	162,522	23,994	35,346	221,862	263,000
1993	212,326	16,499	42,691	271,516	263,000
1994	177,068	23,263	35,500	235,831	240,000
1995	115,227	28,599	34,870	178,696	230,000
1996	107,794	7,000	29,500	144,294	140,000-155,000

[a] Catches are allowed a 7.5% management error in relation to the catch ceiling.

The catch of chinook salmon in the SEAK fishery for the 1979-1996 period has ranged from about 144,000 to 380,000 fish (Table 2). The SEAK harvest during the 1985-1995 period represents about 14 percent of the PSC coastwide chinook catch. In general, the SEAK catch of chinook salmon was higher in the late 1970s and early 1980s, but has substantially declined in more recent years due to increased conservation actions in the fishery as described above. Catch levels since 1980, when catch ceilings/quotas have been in place, do not represent abundance or availability of chinook salmon in SEAK waters. Harvest levels for the SEAK fishery in future years will be determined using a series of target harvest rate indices (relative to a pre-Treaty base period rate) associated with levels of aggregate abundance of the stocks within the fishery as described below. With greater abundance, the harvest rate and subsequent chinook catches increase; at lower abundance, the harvest rate and chinook catches decline.

THE CHINOOK MANAGEMENT PLAN FOR 1997-2003

The chinook management plan for the SEAK all-gear salmon fishery for 1997-2003 is described in the U.S. Section LOA (Allen et al. 1996) which is formulated on an abundance-based approach to determining harvest levels each year. Lack of a Treaty agreement for chinook catches and the realization that a set catch ceiling could result in too high harvests in years of poor aggregate-stock production and lost opportunity for harvests in years of high aggregate-stock production led to the development of an abundance-based approach. The agreement (i.e., LOA) reached by the U.S. Section of the PSC in 1996 gives chinook harvest guidelines for the

Table 3. The allowable harvest rate index and corresponding allowable treaty chinook catch for the SEAK fishery, starting in 1997, for each abundance index range. Catch is a function of the preseason abundance index and the corresponding target harvest rate index.

ABUNDANCE INDEX	SPFI - HARVEST RATE INDEX	RANGE OF ALLOWABLE CATCH	
		TROLL	ALL-GEAR
< 0.60	0.55	< 78,539	< 118,172
≥ 0.60 - < 1.18	0.60	85,678 - 168,500	127,097 - 230,625
≥ 1.18 - < 1.90	0.65	182,541 - 293,922	248,177 - 387,403
≥ 1.90	0.70	≥ 316,532	≥ 415,665

SEAK chinook fisheries through 2003. The LOA states: "After 1996, management of the SEAK chinook salmon fisheries will be based on the relationship between the aggregate abundance of chinook stocks available to the SEAK fisheries and an appropriate harvest rate index." The formulas for determining the SEAK catch follows:

The troll catch is: $\text{EXP}(12.38 + \text{LN}(\text{SPFI} * \text{AI})) \equiv 237{,}994 * \text{SPFI} * \text{AI}$

where: AI = Abundance Index obtained from the Chinook Technical Committee (CTC) model output, and
SPFI = Stratified Proportional Fishery Index and varies according to the AI (Table 3) as outlined in the agreement.

The all-gear total catch (TC) is: 20,000 + Troll Catch/0.80

where: 20,000 is the net gear allocation, and
0.80 is the troll gear proportion of the troll and sport fish allocation.

The SPFI is a modification of the CTC fishery index for the SEAK fishery that accounts for both tagged and untagged stocks and for differential stock distribution and harvest rates within six catch strata for the SEAK fishery (CTC 1996). Unlike the CTC fishery index, which is an exploitation rate based estimate, the SPFI estimates relative harvest rate[3] by estimating the

[3] In PSC and CTC usage, harvest rate is the percentage of fish available to a fishery (occurring in the waters) that is taken by the fishery and exploitation rate is the percentage of the total run of the stock or stock group that is taken by a

proportion of the CWTed stocks vulnerable to the SEAK fishery during a base period (1979-1982) and assuming that the distribution of stocks is constant over time. In actuality, the percentage of each stock present in SEAK waters is not known and therefore, the actual base period harvest rate is not known, but by comparing the current harvest rate estimate to the base-period harvest rate estimate, an index of the harvest rate is determined.

The allowable catch range for the SEAK chinook fishery for each range of abundance and its corresponding SPFI is given in Table 3. The preseason aggregate chinook abundance is estimated by the CTC model abundance index. That preseason index will be used with an inseason abundance index in 1997 per an agreed-upon procedure within the U.S. Section of the PSC. The CTC model's preseason forecast of abundance is known to be biased low compared with postseason estimates and postseason estimates are known to be imprecise (as indicated by the change in the estimates reported each year due to refinements in methods or updated data). The chinook agreement calls for a review of these estimates by the CTC.

The annual aggregate chinook abundance is indexed to the average aggregate abundance from a 1979-1982 base period (i.e., average AI equals 1.0 for those years). From 1982 until the last two years, the abundance index has been greater than 1.18; in 1991 and 1993 it was greater than 1.90. The 1985-1995 average abundance index was 1.59. These abundance estimates are from a 1996 calibration of the CTC model as presented in Attachment B of the LOA (Allen et al. 1996). The CTC chinook model has not yet been recalibrated using data from the 1996 fisheries and escapements, precluding its use to forecast the aggregate chinook abundance index for 1997 at this time.

Starting in 1998, a reduction in the SPFI harvest rate index may occur if a threshold number of stocks are below agreed-upon maximum sustained yield (MSY) goals. The stocks and stock groupings are given in the LOA, Attachment C (Allen et al. 1996). Briefly, if a given number of stock groups are not at or above their respective MSY escapement goals for three consecutive years and if further adjustments in the SEAK fishery will improve the escapements and complementary management actions are being taken in other directed marine and freshwater chinook fisheries in the south, then reductions in the SPFI for the SEAK fishery will be taken according to the schedule in Table 4.

Table 4. The reduction in the SPFI harvest rate index, as defined in paragraph 5 of the LOA (Allen et al. 1996), that will be applied in 1998 and beyond if a given number of stock groups are not at MSY levels as defined in Attachment C of the LOA and if other specific provisions relative to SEAK and other chinook fisheries are met (paragraph 5).

REDUCTION IN SPFI	1998, 1999	2000 +
0.025	3-4 stock groups	2-3 stock groups
0.075	5 + stock groups	4-5 stock groups
0.125		6 + stock groups

fishery. Harvest rate is more difficult to estimate, since it is seldom known what proportion of a stock is available, or passes through, a given fishery's waters.

BIOLOGICAL ASSESSMENT OF SNAKE RIVER FALL CHINOOK SALMON IN THE SEAK FISHERY

INTRODUCTION

The past and anticipated impact of the SEAK salmon fishery on Snake River fall chinook salmon is presented in this section. The occurrence of Snake River fall chinook salmon in marine fisheries is estimated using cohort analysis of its indicator stock, its indicator stock being nontransported, subyearling, CWTed releases of Lyons Ferry Hatchery fall chinook salmon. Methods and findings are similar to those detailed in Clark et al. 1995.

The taking of Snake River fall chinook salmon in the SEAK fishery includes: 1) landed catch, those Snake River salmon taken incidentally along with the take of healthy chinook stocks, and 2) incidental mortality, those fish that die after being shaken or picked loose from the gear and returned to the water. In the SEAK fishery, incidental mortality may result from shaking sublegal fish or from releasing chinook salmon taken during chinook nonretention fisheries. There is no visual way of telling the Snake River fall chinook salmon from any other chinook salmon taken in the catch; therefore Snake River fish cannot be treated differentially during the fishery. Estimates of take can be made only after the fishing season is over using recoveries of the CWTed indicator stock. Forecasts of the general level of future takes can be made based on anticipated fishery management actions and predicted Snake River fall chinook abundance.

The take of Snake River fall chinook salmon in SEAK fishery has been and continues to be found to be 1) incidental to the catch of other stocks and 2) a small percentage of the total Snake River fall chinook return, either on a calendar year or cohort basis. As in past years, the SEAK chinook fishery is found not to negatively affect the continued existence or recovery of Snake River fall chinook salmon. Takes in future years, through 2003, given the current management plan and notwithstanding recovery of the Snake River fall chinook population, will remain at low levels.

METHODS

The Indicator Stock and Code-Wire-Tag Analysis

The estimated numbers of naturally spawning Snake River fall chinook salmon caught in the SEAK fishery are determined from analysis of CWT recoveries from Lyons Ferry Hatchery fall chinook salmon. The first release of CWTed Snake River fall chinook salmon from the Lyons Ferry Hatchery was in 1985 using 1983 (yearlings) and 1984 (subyearlings) brood-year (BY) fish. Nontransported, subyearling releases are used as the indicator stock for naturally spawning Snake River fall chinook salmon, as this release strategy is thought to produce fish that best approximate the migrations of naturally spawning Snake River fall chinook salmon. The hatchery has released nontransported, subyearling fall chinook salmon from 1985 through 1990 (BY 1984-1989) and again in 1992 (BY 1991); barged, subyearling releases were made from

1986 through 1991 (BY 1985-1990). Tag recoveries of barged subyearling CWTed releases have been variable. Two BY releases (1987 & 1988) had no CWTs recovered in the SEAK fishery and only a few recovered in other coastal fisheries, while the numbers released were greater than for other barged releases; this suggests poor survival for these early barged releases. The BY 1986 and 1990 barged releases had relatively high numbers of CWTs recovered in coastal fisheries. Due to this apparent variability in survival of barged releases, the only barged release used in this analysis was from BY 1990 for which there was no nontransported, subyearling releases[4]. In this report, " for naturally spawning Snake River fall chinook salmon, the use of the phrase "indicator stock" refers to the appropriate[5] CWTed subyearling Lyons Ferry Hatchery releases of fall chinook salmon.

Tag recoveries may be from either random sampling of the catches or from voluntary returns by the samplers or fishers, i.e., from heads turned in from adipose-clipped fish that were not part of the random sampling process. Due to the small numbers of CWT recoveries of Lyons Ferry Hatchery fall chinook salmon, both random and voluntary recoveries are reported in the recovery tables to show the presence/absence of the indicator stock in the fisheries by age class. Only randomly collected recoveries are used in the cohort analysis to estimate the number of indicator stock and naturally spawning Snake River fall chinook salmon in the catch.

The current cohort analysis is based on the method used in Clark et al. (1995). Since the catches from the winter troll fisheries are combined with the following summer catches in accounting for annual catches, the small number of CWTed recoveries that occur in the October-December portion of the winter fishery are considered to be caught in the next calendar year and the chinook salmon caught are considered to be in the next age class for the cohort analysis. The tag recoveries can be found in either the ADF&G tag database or the PSC coastwide tag database housed by the Pacific States Marine Fisheries Commission (PSMFC). The expansion factors used to expand tag recoveries for the sampling fraction are also found in these databases, except for the SEAK sport fish expansion which were supplied by Sport Fish Division of ADF&G.[6] Estimates of the total catch of the indicator stock in each fishery (SEAK, total Canadian, southern U.S. marine, and Columbia inriver) are grouped by calendar year and by age (from 2 to 5 year-olds).

Estimation of Snake River Fall Chinook Salmon

Estimates of the escapement of naturally spawning Snake River fall chinook salmon and dam loss (those that do not survive the journey upstream due to nonfishing mortality) are based on information from the Technical Assessment Team of the PFMC. While hatchery Snake River fall chinook salmon return to the hatchery rack as age-2 fish in relatively high numbers, the naturally spawning fall chinook salmon do not. Naturally spawning age-2 returns are not consistently reported (escapements are generally given in numbers of "adult" fish) and are assumed to be small. In this analysis, no estimates are made for fishing mortality of age-2 naturally spawning Snake River fall chinook salmon. The age distribution used for the naturally

[4] The PSC Chinook Technical Committee uses these same releases in their exploitation analyses (CTC 1996).
[5] Mostly nontransported releases, but including the one barged BY 1990 release.
[6] These will be reported in the PSMFC database within the next year.

spawning escapements is that given in Clark et al. (1995) for 1988-1993; for 1994-1996 the age is determined assuming a constant proportion (the average of the 1988-1993 data) of each age class within a cohort.

Estimates of catches of Snake River fall chinook salmon are made by multiplying the catch of the indicator stock by the ratio of naturally spawning fall chinook escapement to indicator stock return (at the hatchery rack or adjacent dam) for each age group. This assumes that the ratio of age specific Snake River to Lyons Ferry fall chinook salmon are the same in the escapement as in each of the marine harvests and the inriver harvest. Estimates of the rates of incidental mortality for each fishery are taken from CTC analyses for the years 1988 to 1993. For 1994 to 1996 incidental mortality is assumed to be proportional to the catch. The average ratio of incidental mortality to landed catch for BY 1984-1989 is used to determine total incidental mortality for the cohort and the average distribution among the age classes is used to determine age specific incidental mortality. Landed catches and incidental mortalities over age classes occurring for each calendar year are added to give annual total fishing mortalities.

Unfortunately, for the sake of Snake River fall chinook analyses, the 1991 and 1993-1994 BY hatchery releases were all yearling chinook salmon. In this analysis, it was necessary to estimate the missing data for BYs 1983 (age-5 fish in 1988 catches), BY 1991 (all ages for contributions to 1994-1996 catches, and BY 1993 (age-3 fish in 1996 catches). Age-5 catches for the 1983 BY are estimated using the 1984-1986 and 1988 BY average exploitation rate for age-5 fish (there were no age-5 CWTed fish recovered from the 1987 BY) and the 1984-1988 average interdam survival (method of Clark et al. 1995). For the 1991 and 1993 BY contributions, average interdam survival for 1988-1996 was used (57%) and 1984-1990 & 1992 average marine exploitation rates and inriver harvest rates were used, applying them to Snake River age-specific cohort escapements.

The estimates of Snake River fall chinook salmon mortality are expressed in both numbers of fish and in adult equivalents (AEQ), i.e., the number of fish that would have made it to the spawning grounds in the absence of further fishing mortality. AEQ estimates are calculated by multiplying the mortality in numbers of fish by the rate of maturation and the rate of natural survival.

Accrual Analysis

To exemplify the effect of the SEAK harvest of Snake River fall chinook salmon on spawning escapements, the SEAK catchers were hypothetically reduced to zero and the foregone harvest was reallocated to the other fisheries on the stock, both marine and inriver, to the dam mortalities, and to the spawning escapement.

The number of Snake River fall chinook salmon that would make it to the spawning grounds in the absence of the SEAK fishery but with the other fisheries operating as usual was estimated using an accrual analysis. The SEAK harvest was set to zero and the other fisheries maintained their same harvest rates. To determine the non-SEAK harvests, exploitation rates were recalculated based on the number of fish surviving the SEAK fishery rather than on the total

return. These adjusted exploitation rates were then applied to the total chinook return to give total harvest by each fishery. The accrual of chinook salmon to each fishery and to the escapement in the absence of the SEAK fishery was then determined by subtracting the theoretical mortality in the absence of the SEAK fishery from the actual mortality estimates by the SEAK fishery).

RESULTS

Lyons Ferry Hatchery Coded-Wire-Tag Recoveries

Tag recoveries from the indicator stock, i.e., appropriate CWTed subyearling Lyons Ferry Hatchery fall chinook releases, in the SEAK catch are available starting in 1987. The number of CWTs recovered (includes both random sampling and voluntary returns) in the SEAK fishery each year is small (Table 5 by brood year and Table 6 by calendar year) given the number of CWTed fish released and the relatively high sampling rate in the SEAK fishery of around 40%. Of the 1,881,055 CWTed chinook released from the hatchery and used in this analysis (Table 5), 81 CWTed fish were recovered in the SEAK fishery (0.004%), of which 71 were from the random sampling program and 10 were voluntary returns.

The average age distribution of recovered CWTed fish is 69% age 4, 24% age 5, and 6% age 3. This age distribution is an indication of gear selectivity, not of age structure in the population. Only one out of a total of 81 CWT recoveries during the 1987-1996 SEAK fishery was an age 2 chinook salmon and that was from the one barged release (1990 BY) used in the analysis. Most of the SEAK recoveries of the indicator stock were taken in the short summer fishery which occurs mainly in July (Table 7).

Table 5. Number of indicator stock fish (i.e., appropriate CWTed subyearling fall chinook) released by the Lyons Ferry Hatchery and the number of CWTs subsequently recovered in the SEAK fishery by brood year. Only nontransported releases are included except for 1990 when only barged releases were made (barged CWT numbers in ***italics***). An NR indicates 'no release' of an appropriate indicator group of fish for that brood-year; an NA indicates data not available yet.

BROOD YEAR	TAGGED SUBYEARLING RELEASES	CWTS RECOVERED IN THE SEAK FISHERY				
		AGE 2	AGE 3	AGE 4	AGE 5	TOTAL
1984	234,985	0	3	9	4	16
1985	246,625	0	0	6	4	10
1986	251,646	0	0	11	1	12
1987	248,739	0	0	2	0	2
1988	226,478	0	0	1	0	1
1989	246,873	0	0	3	4	7
1990	222,532	***1***	***2***	***16***	***6***	***25***
1991	None	NR	NR	NR	NR	NR
1992	203,177	0	0	8	NA	8
TOTAL	1,881,055	1	5	56	19	81

Table 6. The number of CWTs recovered from the indicator stock (i.e., appropriate subyearling Lyons Ferry Hatchery fall chinook releases) in the SEAK catches from 1987-1996. The data are from Table 5 arranged by recovery year instead of brood year. An NR indicates 'no release' of an appropriate indicator group of fish for that brood-year.

YEAR OF RECOVERY	AGE 2	AGE 3	AGE 4	AGE 5	TOTAL
1987	0	3	NR	NR	3
1988	0	0	9	NR	9
1989	0	0	6	4	10
1990	0	0	11	4	15
1991	0	0	2	1	3
1992	*1*	0	1	0	2
1993	0	*2*	3	0	5
1994	0	NR	***16***	4	20
1995	0	0	NR	***6***	6
1996	0	NR	8	NR	8
TOTAL	1	5	56	19	81

Table 7. The seasonal distribution of coded-wire tags recovered in the SEAK fishery from the indicator stock (i.e., nontransported and BY 1990 barged, subyearling, Lyons Ferry Hatchery fall chinook releases).

Age	Oct-Dec	Jan-Apr	May-Jun	Jul-Sep	Total
2	0	0	0	1	1
3	5	0	1	4	10
4	6	1	5	45	57
5	0	2	3	8	13
Total	11	3	9	58	81

Table 8. Estimates of Snake River fall chinook landed catch and incidental mortality in the SEAK fishery based on CWT analysis. Total mortality is also given in adult equivalents (AEQ) and the percent of total mortality due to incidental mortality is .

	FISHING MORTALITY				PERCENT
YEAR	LANDED	INCIDENTAL	TOTAL	TOTAL IN AEQ	INC. OF TOT.
1988	184	29	213	209	14%
1989	190	43	233	224	18%
1990	31	10	41	39	24%
1991	178	51	229	228	22%
1992	100	34	134	132	25%
1993	140	53	193	184	27%
1994	305	40	345	338	12%
1995	59	13	72	71	10%
1996	45	43	88	81	49%
Average	137	35	172	167	23%

Estimates of Snake River Fall Chinook Fishing Mortality

The estimated landed catch and incidental mortality of Snake River fall chinook salmon in the SEAK fishery are given in Table 8. By calendar year, incidental mortality makes up around 23% of the total estimated SEAK fishery mortality on this chinook stock (1988-1996 average). In the SEAK fishery, most of the age-3 mortality is due to incidental mortality while only about 17% of the age-4 & 5 mortality is due to incidental mortality. Only about 6% of the total mortality is composed of age-3 fish.

Run reconstruction (all sources of fishing and dam mortality and escapement) of the naturally spawning Snake River fall chinook salmon, based on CWT analysis, is given in Table 9. The average (1988-1996) fishing induced mortality by the SEAK fishery on the Snake River fall chinook salmon (i.e., exploitation rate) is about 8% of the total run expressed in adult equivalents; annual estimates range from 3% to 17% (Figure 3). The SEAK fishing mortality on Snake River fall chinook salmon may be reasonably expected to account for, on average, less than 10% of the estimated total run.

Since 1991 total fishing mortality of Snake River fall chinook salmon from all fisheries has decreased from around 70% to under 50% of the annual return; however, the savings accrue to both dam loss and spawning escapement, with the result that spawning escapement has only increased from 10% of the run to around 25-30% of the run (Figure 3).

Table 9. Run reconstruction for naturally spawning Snake River fall chinook and exploitation rates by the SEAK fishery. The estimated total fishing mortalities are given in adult equivalents (AEQ) and are based on CWT recoveries of Lyons Ferry Hatchery chinook salmon. Dam loss rates and escapements are provided by Technical Assessment Committee of the Pacific Fisheries Management Council (PFMC). Numbers for 1996 are preliminary; CWT data available only for SEAK fishery to date.

	FISHERY MORTALITIES						
YEAR	ALASKA	CANADA	SOUTH COAST	COLUMBIA INRIVER	DAM LOSS	ESCAPE-MENT	TOTAL RUN
1988	209	1,224	504	1,627	889	368	4,821
1989	224	867	399	1,331	501	295	3,618
1990	39	157	114	212	134	78	733
1991	228	86	121	374	476	318	1,604
1992	132	428	49	159	580	549	1,897
1993	184	476	95	199	458	742	2,155
1994	338	458	41	206	595	406	2,045
1995	71	135	65	187	528	350	1,336
1996	81	306	156	188	1,097	862	2,690
Average	167	460	172	498	584	441	2,322

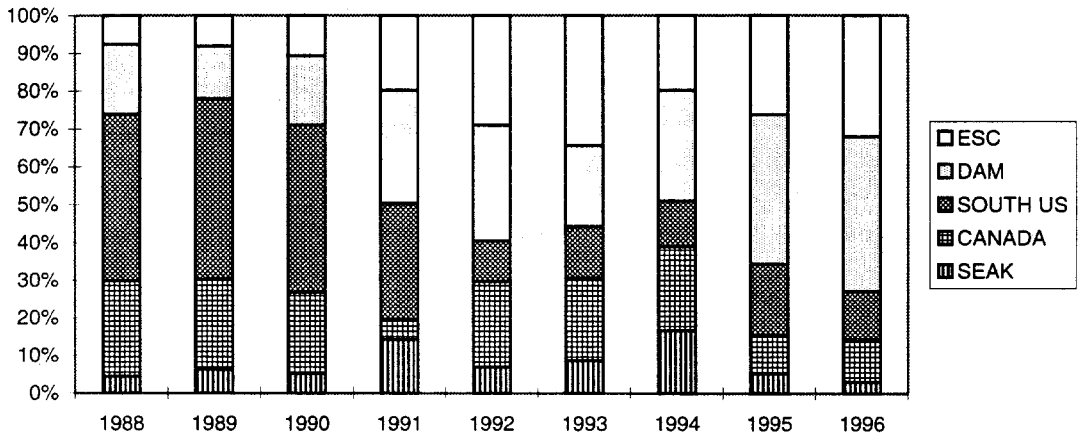

Figure 3. Exploitation rates on Snake River fall chinook salmon by the SEAK fishery, the Canadian fishery, and the southern U.S. fisheries, dam mortality, and the percentage of the run remaining for spawning escapement.

UPDATE in 1996 data as of 3/19/97

Table 9. Run reconstruction for naturally spawning Snake River fall chinook salmon. The estimated total fishing mortalities are given in adult equivalents (AEQ) and are based on CWT recoveries of Lyons Ferry Hatchery chinook salmon. Dam loss rates and escapements are provided by the Technical Assessment Committee of the Pacific Fisheries Management Council (PFMC). Numbers for 1966 are preliminary, but have been updated based on data available as of 3/19/97.

YEAR	ALASKA	CANADA	SOUTH COAST	INRIVER	DAM LOSS	ESCAPEMENT	TOTAL RUN
1988	209	1,224	504	1,627	889	368	4,821
1989	224	867	399	1,331	501	295	3,618
1990	39	157	114	212	134	78	733
1991	228	86	121	374	476	318	1,604
1992	132	428	58	158	580	549	1,906
1993	184	475	50	198	457	742	2,107
1994	275	410	81	191	584	406	1,947
1995	115	210	85	283	492	350	1,534
1996	86	201	208	98	811	639	2,043
average	166	451	180	497	547	416	2,257

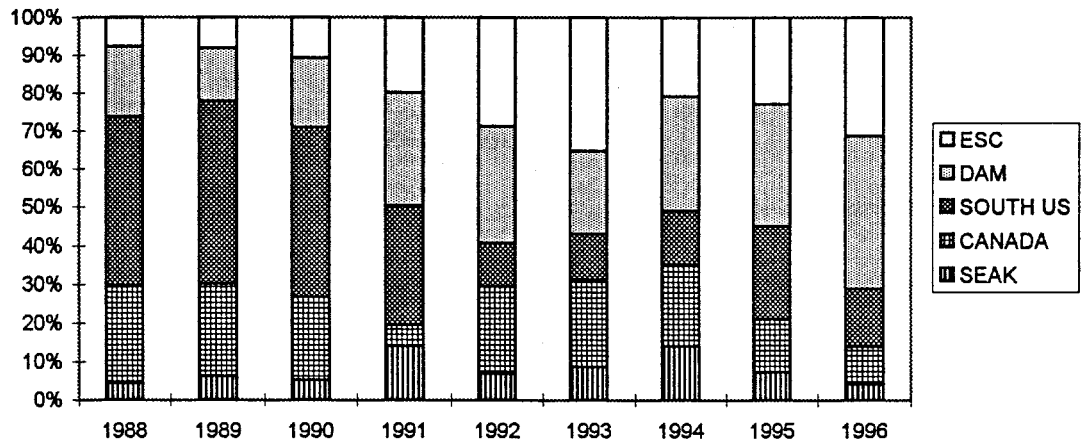

Figure 3. Exploitation rates on Snake River fall chinook salmon by the SEAK fishery, the Canadian fishery, and the southern U.S. fisheries, dam mortality, and the percentage of the run remaining for spawning escapement.

Accrual of Snake River Fall Chinook to Escapement in the Absence of a SEAK Fishery

In the hypothetical situation of no SEAK salmon fishery, the foregone harvest of Snake River fall chinook salmon by the SEAK fishery would be vulnerable to other fisheries along the Pacific coast, fisheries within the Columbia River, and to dam loss during migration upriver. The contribution of this foregone harvest to other fisheries, given no management change in these fisheries, to dam loss, and to escapement is given in Table 10. The percentage of the foregone SEAK harvest of Snake River fish that would actually add to the escapement is referred to as the accrual rate.

On average, only about 34 chinook salmon (approximately 17 females[7]) would accrue to the spawning escapement in the complete absence of the SEAK fishery. On average, about 50% of the foregone Snake River fall chinook harvest from the SEAK fishery would be harvested in other coastal and inriver fisheries, assuming no change in their fishing patterns. Next, about 58% of the Snake River fall chinook salmon that made it past the fisheries would not survive the migration upriver through the dams. This would leave 22% of the foregone SEAK Snake River fall chinook harvest to accrue to the spawning grounds (Table 10), or about one out of every 5 Snake River fall chinook salmon. Thus, on average, only 1.8% (22% of the 8% of the population taken in the SEAK fishery) of the Snake River fall chinook population would be added to the escapement by the extreme management action of closing the entire SEAK fishery (net, troll, and sport).

Table 10. The accrual of additional Snake River fall chinook salmon to other fisheries, dam loss, and escapement if there were no SEAK fishery exerting mortality on this stock. Numbers of fish are in adult equivalents (i.e., after natural mortality). The accrual rate is the percent of fish from the SEAK fishery that would add to the escapement.

YEAR	FISHERY MORTALITIES				DAM LOSS	ESCAPE-MENT	ACCRUAL RATE
	ALASKA	CANADA	SOUTH COAST	COLUMBIA INRIVER			
1988	0	53	22	73	44	18	9%
1989	0	57	24	91	31	19	9%
1990	0	8	6	12	9	5	13%
1991	0	3	17	77	80	51	22%
1992	0	35	1	9	45	42	32%
1993	0	47	9	20	41	67	36%
1994	0	119	3	53	98	65	19%
1995	0	10	3	14	27	18	25%
1996	0	14	9	7	28	23	28%
AVERAGE	0	38	10	40	45	34	22%

[7] Assuming a 50:50 ratio of males to females. Since most of the Alaska fishing mortality is on age-4 and -5 fish, this is a reasonable assumption. Age-2 and -3 fish returning to the spawning ground are thought to have a higher number of males than females, although, there is no sex ratio information available for naturally spawning Snake River fall chinook salmon.

DISCUSSION

Suitability of Indicator Stock

There are no direct measures of the ocean migration routes of naturally spawning Snake River fall chinook salmon. A CWTed subyearling hatchery release of subyearling fall chinook salmon has been used as an indicator stock for migratory movement of the naturally spawning Snake River fall chinook salmon in this analysis as well as in coastwide chinook analyses by the PSC (CTC 1994, 1996), using nontransported releases when possible. There is no hard evidence for the suitability of using this hatchery stock as an indicator for the migration of Snake River naturally spawning fall chinook salmon. The hatchery stock originated from brood stock originally taken about 10 years ago from the naturally spawning stock and is released into the Snake River by the Lyons Ferry Hatchery. Because different release strategies result in changes to the migration patterns of these hatchery fish, only the subyearling releases have been used as indicators of the naturally spawning Snake River fall chinook distribution in marine fisheries and, when available, nontransported releases have been used in preference to barged releases. Subyearling releases are assumed to better approximate the juvenile naturally-spawning stock in their downstream migration than yearling releases, since the naturally spawning fall chinook salmon are zero check fish (i.e., leave the fresh water during their first year). Analysis of tag recoveries indicates that the ocean distribution of yearling-released fish is more southerly than that of subyearling-released fish (NMFS 1995a).

Due to the small number of Lyons Ferry fall chinook salmon recovered in the SEAK fishery, the coast wide standard of a 20% sampling fraction (even doubling that to 40% as is usually done in the SEAK fishery) is not sufficient to give reliable recovery rates given releases on the order of two hundred thousand CWTed fish. From Tables 5-7 it can be seen that tag recovery for many of the strata is zero, indicating abundance levels too low to estimate precisely.

A comparison of the relative numbers of age-2 fish in the naturally spawning Snake River fall chinook population and Lyons Ferry rack returns shows that a much larger percentage of hatchery fish return as age-2 fish than for the naturally spawning fish. The 2-year old hatchery returns most likely have not migrated as far north as Alaska and probably do not represent migration routes of the age-2 naturally spawning fish. This suggests a difference in maturation rates and migration patterns for these two populations of chinook salmon. The consistent lack of age-2 recoveries of CWTed fish in the SEAK catches may indicate that these juvenile fish are not found in SEAK waters during the fishing periods or are not susceptible to the gear. In a study by Orsi and Jaenicke (1996) to examine the distribution of pre-recruit chinook salmon in SEAK waters, using smaller mesh gear than used commercially, no CWTed subyearling releases of Lyons Ferry Hatchery fall chinook salmon were recovered, although recoveries were made for yearling releases and for subyearling releases of other Washington/Oregon stocks. It is likely that age-2 fall chinook salmon from the Snake River are not as vulnerable to SEAK fishery as the older age classes and that southern catches of age-2 hatchery stock is greater than that of the natural spawning stock; therefore, age-2 naturally spawning fall chinook salmon were not considered further in this assessment. This analysis assumes that naturally spawning Snake River

fall chinook are not caught in any of the fisheries and do not return as jacks and requires only that the age-3 to age-5 hatchery and naturally spawning fish behave similarly. This would tend to underestimate the total return of naturally spawning fall chinook if jacks (age-2 fish) are not being reported in the escapements, but does not effect the analysis of rebuilding as jacks probably do not add significantly to the spawning effort.

Comparison of ADF&G and CTC Analyses

The cohort analysis used in this assessment (ADF&G analysis) uses catches of a CWTed-hatchery indicator stock to estimate only the naturally spawning Snake River fall run component of the chinook catch. This differs from the CTC analysis which partitions the total chinook catch into the various stock components, using one set of indicator stocks, CWTed hatchery releases, to determine fishery specific exploitation rates and another set of indicator stocks, naturally spawning stocks with escapement estimates, to determine relative abundance of the stocks. Exploitation rates per stock/fishery, average proportion of stocks in each mixed stock fishery calculated from a base period, and current spawning escapements are then used, in an iterative approach, to estimate the catch of each of the coastwide chinook stocks in each fishery. A comparison of the results for SEAK fishery mortalities from these two different analyses are given in Table 11. The estimates include both landed catches and estimated incidental mortalities from fishing and are expressed as adult equivalents (AEQ).

Table 11. A comparison of the results of two approaches used to estimate total fishing of naturally spawning Snake River fall chinook salmon in the SEAK fishery: The CTC model (model calibration 9617) and the current ADF&G CWT analysis. Values are in adult equivalents.

Year	CTC Model	ADF&G CWT
1988	145	209
1989	130	224
1990	116	39
1991	66	228
1992	64	132
1993	90	184
1994	86	338
1995	98	71
1996	NA	81
average	99	167

Since the analysis used in the ADF&G assessment uses age and year specific ratios of hatchery to naturally spawning chinook escapements, the estimate of those ratios and resulting annual catches will be more variable than if one assumed a constant ratio for all ages within a cohort. However, if the distribution of age-at-maturation differs for the hatchery and naturally spawning

stocks, as is likely[8], it would not be expected that there would be a constant ratio of hatchery to naturally spawning stocks in each age-class in either the marine waters or in the escapements.

The annual magnitude of the estimated take of naturally spawning Snake River fall chinook salmon in the SEAK fishery as estimated by the CTC model and the ADF&G cohort analysis averages 99 and 167 chinook salmon, respectively (Table 11). The take of Snake River fall chinook salmon estimated by the ADF&G CWT analysis is on average twice as high as the estimate from the CTC chinook model, ranging from 4 times as high in 1994 down to one third the size in 1990. Given the number of assumptions that must be made using either method and the amount of variability in the data, these estimates are probably not significantly different. The difference in estimates between years for either analysis is due to a combination of factors including estimation variability and differences in abundance and availability of the salmon to the SEAK fishery. Assuming similar availability, harvest rates, and stock abundance from year to year, the CTC analysis would estimate the take between 80 and 120 fish 50% of the time from year to year, and the ADF&G model, between 100 and 230 fish.

The Incidental Take of Snake River Fall Chinook in the SEAK Fishery

Snake River fall chinook salmon mix in the ocean with other stocks of salmon and, not being visually recognizable from other stocks of the same species, are taken and killed in the general harvest of salmon. In the case of most fisheries, fish from the listed stock group are landed along with the other salmon in the catch; in the case of chinook nonretention (CNR) fisheries, Snake River fall chinook salmon are released along with any other chinook salmon taken by the gear.

For encountered chinook salmon during CNR fisheries, there is an expected release-related mortality of less than 30%. The 30% mortality rate has been used in the CTC estimation of incidental mortality for troll and sport fisheries; however, that assumption has been recently reviewed and revised downward (CTC 1997). Incidental mortality estimates for commercial troll, legal size fish (the majority of SEAK incidental mortalities) is now estimated at 21%. These new estimates have not been incorporated into the present estimates of Snake River fall chinook fishery mortality.

The estimated harvest of naturally spawning Snake River fall chinook salmon is a very small fraction of the total chinook harvest in the SEAK fishery (Table 12). Over the 1988-1996 period, this truly incidental harvest of Snake River fall chinook salmon has ranged from 0.01% to 0.12%, (average of 0.05%, or one out of each 2,000 fish) of the annual total chinook harvest in the SEAK fishery.

[8] A larger proportion of Lyons Ferry hatchery fall chinook return to the racks at age 2 (around 21%) than naturally spawning Snake River fall chinook to the spawning ground (around 13%, LaVoy & Mendel 1996).

Affect of SEAK Fishery on Snake River Fall Chinook Recovery

Population Viability Analysis

To determine the potential effects of the incidental taking of naturally spawning Snake River fall chinook salmon in the SEAK fishery, at levels expressed above, on Snake River fall chinook salmon maintaining threshold escapements under the NMFS jeopardy standard (NMFS 1995d), an extensive population viability analysis was done (Clark et al. 1995). The jeopardy standard used by NMFS (i.e., condition for jeopardy to exist), is a probability of less than 70% for Snake River fall chinook salmon to maintain threshold escapements over the long term. Analyses were made with both escapement thresholds of 300 and 500 fish and for periods of 24 and 100 years.

Three exploitation rates for naturally spawning Snake River fall chinook salmon by the SEAK fishery were tested for the jeopardy assessment: 1) an absolute zero impact; i.e., the exploitation rate was set at zero for all age classes; 2) a low potential impact, the exploitation rate was based on the 1991-1993 average rate; and 3) a high potential impact, the exploitation rate was based on the 1979-1982 average rate. The third scenario was chosen as the period of highest PSC model estimated SEAK exploitation rates on Snake River fall chinook salmon.

The results confirmed that the net effect of varying the exploitation rate in the SEAK fishery within a range from zero to the highest levels observed is almost nil in terms of reducing the probability of the Snake River fall chinook salmon not achieving threshold survival values. Thus, the extensive population viability analysis by Clark et al. (1995), submitted to NMFS as part of the 1995 ESA Section 7 consultation, concluded that the incidental take by the SEAK salmon fishery does not jeopardize the continued existence of ESA listed Snake River fall chinook salmon.

Accrual Analysis

To assess the impact of the SEAK fishery on the number of Snake River fall chinook salmon reaching the spawning ground, the Snake River fall chinook salmon "saved" from SEAK fishing mortality by a hypothetical closure of the entire SEAK fishery (net, troll, and sport) were redistributed among the remaining fisheries, dam losses, and escapement. This "saving" or foregone catch is, on average, 167 Snake River fall chinook salmon per year. The analysis showed that only about 34 of these Snake River fall chinook would be added to the escapement. Any reasonable manipulation of the SEAK salmon fishery (something far less than complete closure) would add even less chinook salmon to the spawning grounds and, therefore, is an ineffective management tool to increase Snake River fall chinook spawning.

Table 12. The estimated Snake River fall chinook landed catch from the SEAK fishery, the total number of chinook landed by the SEAK fishery (Treaty plus hatchery add-on), and the percentage Snake River fall chinook in the total catch of chinook salmon by the SEAK fishery. The catch estimates for 1996 are preliminary.

Year	Snake River Landed Catch	Total Chinook Catch	Percentage of Catch
1988	184	279,320	0.07%
1989	190	291,030	0.07%
1990	31	366,869	0.01%
1991	178	357,375	0.05%
1992	100	258,667	0.04%
1993	140	304,102	0.05%
1994	305	264,218	0.12%
1995	59	235,746	0.03%
1996	45	217,226	0.02%

Snake River Fall Chinook Recovery

Both the accrual analysis and population viability analysis have shown that the improved recovery of the stock by elimination or even any reasonable manipulation of the SEAK fishery and its incidental take is near nil.

Based on the 1988-1996 CWT analysis, the SEAK fishery, which is the fishery situated the furthest from the Snake River, causes the least mortality on the Snake River fall chinook salmon. On average, during the 1988-1996 period, 8% of the age-3 and older ESA listed Snake River fall chinook salmon returning in a given year were taken in the SEAK fishery, 18% were taken in the Canadian fishery, and 26% were taken in the Washington and Oregon ocean and inriver fisheries. Another 27% were lost to dam mortalities on their way to the spawning grounds, and only 21 % of the return made it to the spawning grounds (Table 9, Figure 3). During this period, the combined fishery exploitation rate on the listed ESA species has dropped from about 76% to 30%, while the escapement percent has only risen from about 8% to 29%. Despite this slow rate of increase to the spawning grounds, due to increased percent of dam mortalities (Figure 3), annual returns and escapements have been increasing somewhat since 1990 (Table 9).

The preliminary[9] estimate of the escapement of naturally spawning Snake River fall chinook salmon for 1996 is 862 fish (Table 9). This escapement is the highest recorded during the 1986 to 1996 period and is over twice the average escapement (381) for the preceding ten-year period. Escapements of naturally spawning Snake River fall chinook salmon are expected to increase

[9] Preliminary estimate as of February 1997. There is some indication (Glenn Mendal, per comm) that this estimate may be revised downward to something on the order of 600-650 fish; this would still be higher than normal escapement and would be the second highest escapement on record, after 1993 with 742 fish. A decrease in the estimate of 1996 escapement would cause decreases in the catch estimates of Snake River fall chinook in all fisheries for 1996 and increases in the 1994 and 1995 catch estimates.

further based on the observed favorable outmigration conditions in 1995 and 1996; and as a result of the new stock supplementation program which began juvenile releases above Lower Granite Dam in 1996 (NMFS 1996d).

ADF&G intends to manage the SEAK fishery based on chinook abundance as explained in detail in the 1996 LOA (Allen et al 1996). The 1997 chinook salmon abundance index for SEAK is not anticipated to be lower than 0.70 nor higher than 1.85, a range that will result in aggregate catches between about 145,900 and 377,600 treaty chinook salmon. This range of harvests encompasses both the total chinook harvest levels taken from 1979 to 1984 and the treaty chinook harvest levels taken from 1985 to 1996 in the SEAK fishery (Table 2).

The harvest levels in the future will be correlated with the total chinook abundance, such that when abundance is up, higher levels of harvest will be allowed and visa versa. The SEAK fishery harvest rates during the 1979-1982 base period (SPFI index of 1.0) were the highest of the 1979-1996 period. The LOA established harvest rate indices, relative to the base period, between 0.55 and 0.70 for the SEAK fishery for the 1997-2003 period (Table 3), such that harvest rates will remain below 1979-1982 levels. So long as the SEAK salmon fishery is managed so as to incur these reduced harvest rates, the SEAK fishing mortality on the Snake River fall chinook stock will remain within recent levels and will not jeopardize the ESA listed Snake River fall chinook continued existence or recovery.

A reasonable range of expected catches of naturally spawning Snake River fall chinook salmon in the SEAK fishery, given the current abundance of the stock and current management of the fishery, is about 100-200 fish annually, expressed in adult equivalents. With the lack of an appropriate indicator stock (CWTed nontransported, subyearling hatchery fall chinook releases) or a marked naturally spawning stock, this projected estimate of the annual take by the SEAK fishery will have to suffice for future years.

MONITORING AND MINIMIZING IMPACTS BY THE SEAK FISHERY

DETAILED MONITORING PLANS

As part of the coastwide chinook monitoring program, ADF&G staff sample all SEAK chinook fisheries for the presence of adipose fin clips, an indication of having a CWT. Hatchery produced chinook salmon are CWTed to, among other uses, act as indicator stocks for the general distribution of naturally spawning stocks coastwide. Coastwide standards for sampling are 20% of landings from each gear/time/area strata.

Salmon catches from all Alaska fisheries are monitored through the use of fish tickets which indicate how many of each species are landed and in which regulatory district they were caught. In SEAK, landed chinook salmon are also sampled for the presence of CWTs in order to determine origin of the fish and hatchery contributions to the total catch. For the SEAK commercial troll fishery, sampling rates of 35-40% are a regular part of the ADF&G salmon program. Sport fisheries are sampled inseason through the use of creel surveys and postseason through a mail survey. For any randomly sampled fish found with a missing adipose fin, the head is sent to the ADF&G Coded Wire Tag Processing Lab in Juneau for tag recovery and decoding.

As there are no known techniques to directly identify populations of Snake River fall chinook salmon in the Alaska catches or any other mixed stock catch along the Pacific coast, we must rely on the tagging of indicator hatchery stocks until such time as tagging of the naturally spawning population can take place. The naturally spawning stock is not currently tagged. While scale pattern analysis and genetic analysis are used successfully for other species and stocks, they are not developed sufficiently to identify Snake River fall chinook salmon.

For naturally spawning Snake River fall chinook salmon, the CWTed Lyons Ferry Hatchery subyearling chinook releases, preferably nontransported over barged, are used as an indicator stock; this assumes that the hatchery stock distribution in the ocean approximates that of naturally spawning Snake River fall chinook salmon. CWT recoveries in the ocean fisheries are used to determine distribution in the harvests. Chinook salmon caught in the SEAK fishery are sampled for CWTs and analyses are performed both inseason and postseason to determine hatchery contributions to the harvests. In this way, the catch of Lyons Ferry Hatchery chinook salmon may be monitored and the catch of naturally spawning Snake River fall chinook salmon may be inferred and monitored.

ADF&G has a port sampling program that is dedicated to sample SEAK commercial fishery landings for adipose fin clipped fish at levels of 20% per strata or greater. The chinook portion of this program is funded by both the State of Alaska and U.S./Canada federal funds with a combined annual budget of about $118,000 including about $55,000 from U.S./Canada federal funds (the total Anadromous Port Sampling Project budget, for all salmon species, totals about $364,000). This CWT monitoring program is part of the regular ADF&G chinook management program, and is a permanent part of the ADF&G salmon program.

The Sport Fish Division of ADF&G conducts a creel survey to determine sport catches and sample for adipose-fin-clipped fish. The annual cost for the chinook CWT sampling part of the survey is about $227,000 and is funded by Dingell-Johnson federal funds (~75%) and funds from sport fishing licenses and chinook salmon tags.

The ADF&G Coded Wire Tag Processing Lab processes tags from heads of adipose clipped salmon that are sent in from the commercial port sampling program, the sport creel sampling program, and from voluntary returns by SEAK fishermen. The lab generally processes over 10,000 chinook heads per year; the heads are recovered from commercial, cost-recovery, sport, personal-use/subsistence, and test fisheries, and from escapement surveys, hatchery rack returns and broodstock takes. The lab is funded by the State of Alaska and U.S./Canada federal funds, with an annual budget of around $754,000 (~$124,000 from U.S./Canada federal funds), and is a permanent part of the ADF&G salmon program.

ALTERNATIVE MANAGEMENT ACTIONS

Additional closures beyond those already implemented, either of directed chinook fisheries or chinook nonretention fisheries, have not been implemented since they would result in minor savings (e.g., the accrual of about 17 females to the spawning grounds per year if the SEAK fishery were closed) to the listed species and in major loss of harvest of healthy stocks. The result would be a loss in personal income and food supply as well as the economic hardship to the small coastal communities and native villages located in SEAK.

The healthy and abundant chinook and coho stocks within the area do not warrant either the closure or further restriction of the historical and traditional SEAK salmon fishery. The SEAK troll fishery alone provides substantial revenues (grossing around $35 million a year) to the smaller coastal communities, native villages, and resident fishers of SEAK. The recreational fishery for chinook salmon provides additional income as well as the opportunity to access this renewable resource.

CONCLUSIONS

ADF&G intends to manage the SEAK chinook fishery based on the abundance-based management regime provide by the 1996 U.S. Letter of Agreement (LOA, Allen et al. 1996). This agreement presents a significant development by the U.S. Section of the Pacific Salmon Commission. Subject to further negotiations with Canada, the agreement clarifies the role of the SEAK fishery in rebuilding depressed naturally spawning chinook stocks and sustaining them at healthy levels. Further, the LOA provides for a sharing scheme for the far-north migrating chinook stocks (north-south allocations) and conservation responsibility for stocks originating south of the Washington-Canada border. So long as the SEAK salmon fishery is managed in accordance with the harvest rates specified by the 1996 LOA, the SEAK fishing mortality on Snake River fall chinook salmon will not jeopardize the continued existence or recovery of these fish. This conclusion is based on the following points discussed in this biological assessment.

1) The SEAK fishery incidentally catches only a small number of Snake River fall chinook salmon each year and this number is a small percentage (8%) of the total run of the stock (Table 9).
2) The contribution of Snake River fall chinook salmon to the SEAK catch is a very low, incidental level of around 0.05% (Table 12).
3) Under the LOA chinook management plan (Table 3), SEAK harvest rates will remain within recent levels and these levels average 35-40% below the 1979-1982 base period average.
4) There is a high likelihood of escapements of Snake River fall chinook salmon being in excess of the levels required by the NMFS jeopardy standard given that the proposed continued harvest levels in the SEAK fishery match recent past harvest levels (see jeopardy analysis, Clark et al 1995).
5) Any reasonable manipulation of the SEAK salmon fishery to increase escapement of Snake River fall chinook is an ineffective fishery management action if the intent is to significantly increase the number of chinook salmon on the spawning ground (Table 10).
6) Snake River fall chinook salmon appear to be rebuilding; the escapement of naturally spawning Snake River fall chinook salmon in 1996 is high compared to recorded levels during recent years (Table 9), and further increases in escapements are expected based upon favorable outmigration conditions in 1995 and 1996, and due to the initiation of stock supplementation program in 1996 (NMFS 1996d).
7) The current analysis of the impact of SEAK fishery on Snake River fall chinook salmon through 1996 and the projection of similar levels of impact through 2003 supports the conclusions presented in Clark et al. (1995) of minimal impact and no jeopardy to the continued existence and recovery of Snake River fall chinook salmon.

These points all argue in favor of a biological opinion that the SEAK fishery does not jeopardize the existence and potential recovery of naturally spawning Snake River fall chinook salmon. The State of Alaska, therefore, requests that this biological assessment, as part of the consultation process under Section 7 of the federal Endangered Species Act, result in a determination by the NMFS that the SEAK fishery is not likely to jeopardize the continued existence nor recovery of the Snake River fall chinook salmon and other ESA listed species for the 1997-2003 period.

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ATTACHMENT 1

LETTER OF AGREEMENT REGARDING AN ABUNDANCE-BASED APPROACH TO MANAGING CHINOOK SALMON FISHERIES IN SOUTHEAST ALASKA

W. Ron Allen
David Benton
Robert Turner

June 24, 1996

LETTER OF AGREEMENT REGARDING AN ABUNDANCE-BASED APPROACH TO MANAGING CHINOOK SALMON FISHERIES IN SOUTHEAST ALASKA

The three voting U.S. Commissioners to the Pacific Salmon Commission (PSC) agree on the elements described herein of an abundance-based approach to managing all-gear chinook salmon fisheries in Southeast Alaska (SEAK), subject to any modifications that may be agreed within the U.S. Section or as a result of discussions and negotiations with Canada. They also developed this agreement for the purposes of: (a) establishing a foundation for bilateral negotiations with Canada on a long-term, abundance-based approach to chinook salmon management to be incorporated into an amended Chapter 3 of Annex IV of the Pacific Salmon Treaty; (b) clarifying the role of SEAK and other fisheries in rebuilding depressed naturally spawning chinook stocks and sustaining them at healthy levels; and (c) providing a means for sharing the harvest and conservation responsibility for far-north-migrating chinook stocks originating south of the Washington-Canada border.

1. In 1996, the SEAK salmon fisheries shall be managed for a harvest level of between 140,000 and 155,000 treaty chinook; following the first July opening of the SEAK troll salmon fishery, the U.S. Commissioners will consult on factors affecting the specific target within that range. In addition, in 1996 and thereafter, SEAK fisheries shall be allowed to harvest additional chinook salmon in accordance with hatchery add-on and terminal exclusion procedures set forth in Attachments D and E, respectively.

2. After 1996, management of the SEAK chinook salmon fisheries will be based on the relationship between the aggregate abundance of chinook stocks available to the SEAK fisheries and an appropriate harvest rate index. Unless otherwise agreed, the SEAK fisheries shall be managed annually to achieve the stratified proportional fisheries (harvest rate) index (SPFI) value designated for the applicable abundance index value in the formula set forth below as may be adjusted by the mechanism developed pursuant to Paragraph 4(a)(vi):[1]

   a. at an abundance index less than 0.60 the SEAK troll fishery shall be managed to achieve a SPFI value of 0.55 (subject to any additional provisions developed pursuant to Paragraph 4(b));

   b. at an abundance index equal to or greater than 0.60, but less than 1.18, the SEAK troll fishery shall be managed to achieve a SPFI value of 0.60;

[1] The intent is to maintain the existing overage and underage policy; details of how the 7.5% management range will apply in the context of a changing annual catch will be worked out prior to the 1997 summer fishery.

- Reference points: the abundance index value of 1.18 is the estimated 1985 abundance; the SPFI value of 0.60 is based on a harvest of approximately 200,000 chinook at an abundance index value of 1.0.

c. at an abundance index equal to or greater than 1.18, but less than 1.9, the SEAK troll fishery shall be managed to achieve a SPFI value of 0.65;

- Reference points: the abundance index value of 1.91 is the estimated 1991 abundance; the SPFI value of 0.65 is based on a harvest of approximately 263,000 chinook at the 1985-86 average abundance (index value of 1.25).

d. at an abundance index equal to or greater than 1.9, the SEAK troll fishery shall be managed to achieve a SPFI value of 0.70.

3. The foregoing management regime is represented graphically in Attachment A. The abundance index values referenced above are derived from the Chinook Technical Committee (CTC) model, calibration 9617. The SPFI values are calculated using the SPFI agreed to by the CTC (TCHINOOK (96)-1). The formula used to develop the proportional relationship among abundance, SPFI and catch for the purpose of this agreement is set forth in Attachment B. To the extent the CTC model or SPFI is modified, the reference points identified above shall determine how the harvest rate regime and graph (Attachment A) are re-scaled.

4. The U.S. Section, working bilaterally to the extent Canada will participate, shall complete the following tasks:

a. By October 15, 1996:

i. Review existing escapement goals for a selected subset of the indicator stocks established by the relevant management agencies and their relationship to MSY or other biologically-based escapement objectives, and provide recommendations to the Commissioners.

A) The review for Columbia River Upriver Brights, Columbia River summers, Grays Harbor falls, Skagit summer/falls, and Stillaguamish falls will be completed by October 15, 1996.

B) The U.S. Section will request Canada to assemble information relative to a review of the goals for the WCVI, Skeena, Upper Georgia Strait, and Thompson, and will request that Canada also participate in a workshop to finalize the results of the escapement goal reviews in the fall of 1996.

C) The Commissioners have assigned representatives of the CTC and chinook Work Group to develop by October 15, 1996 a schedule to complete the review for the remaining indicator stocks.

ii. Adopt working definitions for the following key terms used in the rebuilding program: "rebuilt," "rebuilding," "aggregate rebuilding," "pass through," and, "stocks of concern."

iii. Review and improve the accuracy and precision of the CTC model in determining pre-season forecasts of the aggregate chinook abundance available to the SEAK fishery.

iv. Conduct a CTC review of the data collected and agency procedures used to assess the annual abundance and escapement of chinook salmon stocks, and establish a schedule for implementing improvements.

v. Develop and implement a protocol for proposing changes to the CTC model, e.g., calibration procedures.

vi. Develop a technically feasible procedure for estimating the aggregate abundance of chinook available to the SEAK fishery using in-season fishery performance data, for the purpose of adjusting preseason forecasts of harvest levels beginning in 1997.

b. By December 15, 1996, review the harvest rate arrangements associated with abundance index values below 0.60 to determine, based on MSY or other agreed biologically-based escapement objectives, the aggregate abundance at which directed chinook fishing (excepting Alaska hatchery and other terminal exclusions) should not be permitted in the SEAK fisheries, provided that the application of such mechanism will require completion of the tasks identified in Subparagraph 4(a).

c. By January 31, 1997, in the event the CTC cannot agree or the Commission has not resolved the matters contained in Subparagraphs a(iii), a(iv), or a(vi), a Conciliation Board will be utilized to assist in resolving the issue.

5. The SEAK fishery will be managed such that the harvest regime does not contribute significantly to a decline below the MSY or other agreed biologically-based escapement objectives of far-north-migrating naturally-spawning chinook stocks and stock groups as provided in Attachment C. The management actions described in this section are intended to return escapements as expeditiously as possible to MSY or other agreed biologically-based escapement objectives, and will be implemented when: (1) there is a contributing causal relationship between the SEAK fishery and the decline or the decline is due to natural phenomenon; (2) escapements will be improved by further adjustments in the SEAK fishery; and (3) complementary and coordinated management actions are being taken in other directed marine and freshwater chinook fisheries affecting the stock(s).

a. Attachment C lists the escapement indicator stocks, organized into stock groups, and specifies the criteria to be used to assess the status of each escapement indicator stock which will be subject to the provisions of this Paragraph 5.[2]

b. The additional management actions to be taken in the SEAK fishery are those listed in (i) or (ii) as provided below:

i. Adjustments to the target SPFI in the SEAK chinook fishery will be made according to the following schedule, based on the indicated number of stock groups and fishery year:

Reduction in SPFI	Number of Stock Groups by fishery year	
	1998, 1999	2000+
0.025	3-4	2-3
0.075	5+	4-5
0.125		6+

ii. Other management actions as may be agreed will be taken which have comparable conservation benefits as identified in Subparagraph (b)(i) above (e.g., time/area restrictions)[3].

6. The provisions of Attachments D through I are incorporated into this agreement by reference and, as part of the U.S. negotiating position, may be refined and modified as a result of bilateral negotiations. Adoption of a multi-year, abundance based management regime provides the opportunity to develop proposals for reducing chinook non-retention (CNR) mortalities. Accordingly, the relevant management agencies shall develop specific options and implement viable measures to the extent practical in accordance with Paragraph 1 of Attachment G.

7. In the event a dispute arises in connection with implementation of this Agreement or accomplishing the tasks identified herein, the U.S. Section agrees to first use its best efforts to resolve the dispute in a timely manner through existing PSC processes, including negotiation. If that does not result in resolution, the U.S. Section agrees promptly to empanel a Conciliation Board pursuant to 16 U.S.C. § 3632(g)(5) to assist in resolving the dispute.

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[2] For the purposes of Subparagraph 5(a), determinations shall begin in 1996 and only for those stocks for which the escapement goal review has been completed. In the event agreement cannot be reached about whether an escapement objective should or should not be used for the purpose of this section, the matter shall be referred promptly to a Conciliation Board to assist in resolving the dispute.

[3] SEAK fisheries will be managed to achieve escapement objectives for Southeast Alaska and Transboundary River stocks.

8. The Commissioners agree that this agreement constitutes a north/south allocation determination and a "fishing regime" developed pursuant to Section IV of the Stipulation and Order entered March 7, 1985 in Confederated Tribes and Bands of the Yakama Indian Nation v. Baldrige, 608 F. Supp. 833 (W.D. Wash. 1985). So long as harvest levels in the SEAK fisheries are set pursuant to the provisions of this agreement, the Commissioners agree that the provisions outlined in Section V(B) in the aforementioned Stipulation and Order should be held in abeyance.

9. Renegotiation

a. If any one of the following circumstances occurs, any U.S. voting Commissioner may give notice of an intent to renegotiate this agreement, except for Subparagraph (ii), which will require concurrence among at least two voting Commissioners:

i. If, beginning in 1998 and thereafter, the post-season abundance index for the SEAK fishery is below 1.0 for three of four consecutive years.

ii. If, by January 31, 1999, coastwide chinook harvest regimes in Alaska, Canada, and the southern U.S. are incompatible with north/south sharing of far-north-migrating chinook stocks, while maintaining MSY escapements or other agreed biologically-based escapement objectives, given inherent stock productivities, for southern-U.S. origin stock groups (taken as an aggregate) listed in Subparagraph (iv), below.

iii. If management measures adopted pursuant to this agreement result in at least 10 percent deviation in three of five consecutive years from harvest levels established under Paragraph 2, above.

iv. If, beginning in 1998, four of the following far-north-migrating naturally-spawning chinook stocks (or stock groups) are not meeting established MSY escapement objectives or other agreed biologically-based escapement objectives for three of four consecutive years: Upriver Columbia River Brights; North/Central B.C.; Upper Georgia Strait; far-north-migrating Oregon Coastal; Fraser early; Washington coastal falls; Washington coastal spring/summers; West Coast Vancouver Island wild; and Columbia River summers.

v. If, by January 31, 1999, the tasks identified in Paragraph 4 have not been completed or unresolved disputes remain regarding the results of those tasks or their application, and those disputes remain unresolved within the U.S. Section because (1) a Conciliation Board has not been utilized to help resolve the issue; or (2) the dispute remains unresolved even after a Conciliation Board has been involved.

b. The U.S. Commissioners agree that in 2003 they will conduct a comprehensive review of how the abundance-based approach set forth in this letter of agreement is working. Beginning in 2004, if any U.S. voting Commissioner believes that the agreement should be modified, he/she shall give notice of an intent to renegotiate, describing any desired modifications.

c. If a notice of an intent to renegotiate is given under either Subparagraph (a) or (b) above, then the U.S. Commissioners agree to meet and use their best efforts to resolve the dispute and agree upon such modification of this agreement as may be appropriate. If the Commissioners are unable to do so within one year of the notice, then at the request of any voting U.S. Commissioner (except for a dispute arising out of Subparagraph 9(a)(ii), which requires consensus of two voting Commissioners), this agreement will terminate.

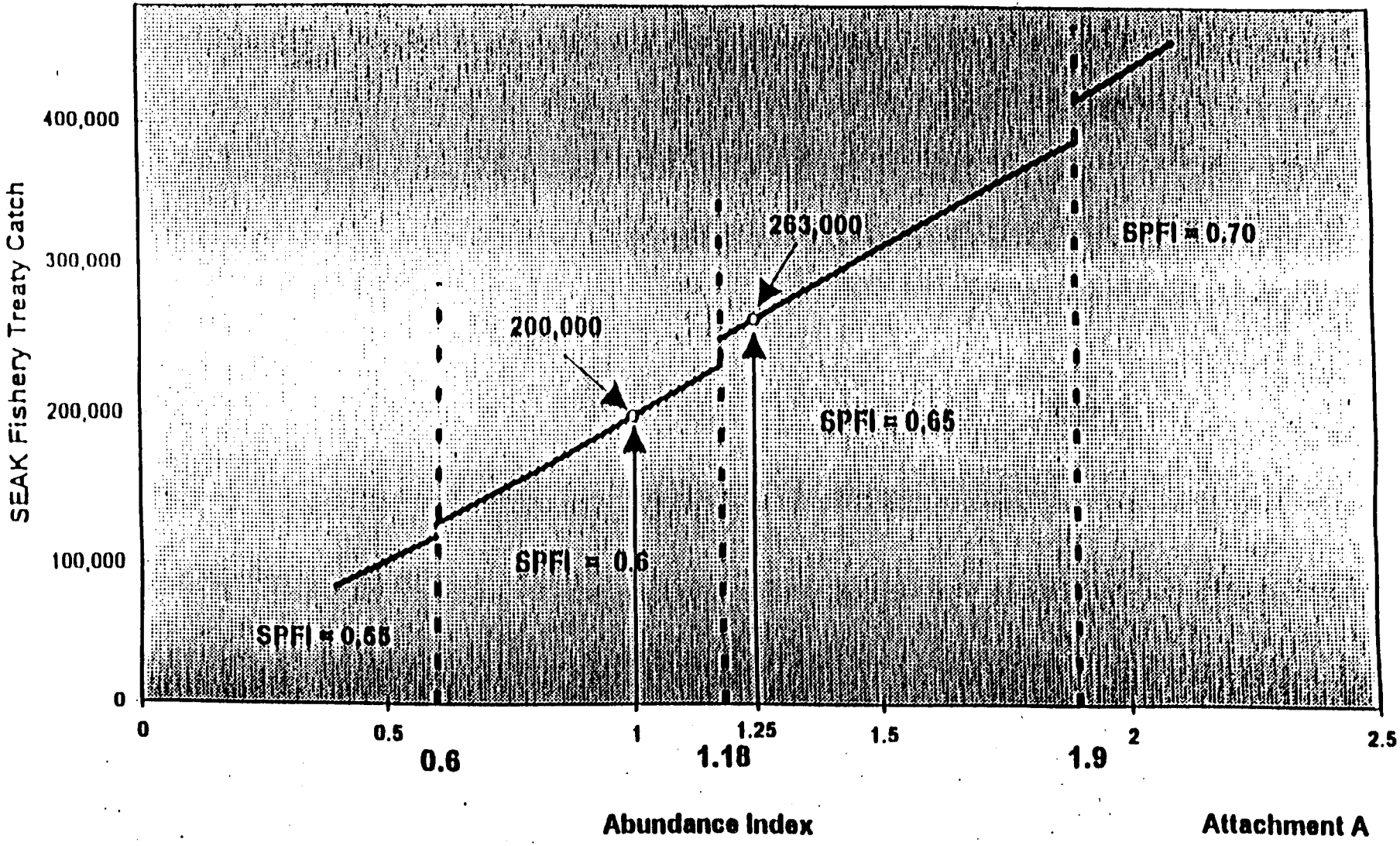
Signed by: Date:

W. Ron Allen, PSC Commissioner for the Treaty Tribes — June 24, 1996

David Benton, PSC Commissioner for Alaska — June 24, 1996

Robert Turner, PSC Commissioner for the States of Washington and Oregon — June 24, 1996

An Abundance Based-Approach for Managing SEAK Chinook Salmon Fisheries



Attachment A

Formulii for Calculating Total Catch from the Stratified Proportional Fishery Index (SPFI) and Abundance Index Value and SPFI and Formulii for Calculating SPFI from Abundance Index and Total Catch

Year	Abundance Indices (March 1996 CTC model)	SPFI based on catch	Troll Catch	Proportional Constant Ln(Catch/(SPFI*Abundance Index))
1979	0.85	1.05	338,000	12.85
1980	1.03	1.11	300,000	12.48
1981	0.91	1.04	248,000	12.48
1982	1.22	0.79	242,000	12.43
1983	1.32	0.98	271,000	12.25
1984	1.34	0.68	236,000	12.46
1985	1.18	0.73	212,827	12.42
1986	1.31	0.53	229,980	12.70
1987	1.53	0.43	230,900	12.78
1988	1.78	0.65	216,427	12.14
1989	1.74	0.55	220,966	12.36
1990	1.81	0.82	263,340	12.09
1991	1.91	0.68	230,712	12.09
1992	1.76	0.49	162,995	12.15
1993	1.92	0.56	211,590	12.20
1994	1.61	0.55	176,059	12.20
1995	0.91			
1996	0.71			
		1979 - 1994 Average		12.38

Note:

Use only troll catch to calculate constant

Troll Catch = EXP(12.38 + LN(SPFI * Abundance Index))

Total Catch = 20,000 + Troll Catch / 0.80

SPFI = EXP(LN(Troll Catch/Abundance Index)) - 12.38)

Attachment B

ATTACHMENT C

This Attachment sets forth criteria for determining when Canadian and southern U.S. stocks and stock groups are subject to provisions of Paragraph 5 of the agreement dated 6/24/96. Escapement indicator stocks listed in this attachment were selected because the SEAK fisheries account for at least 15% of their total fishing mortalities.

Determinations of stock status shall begin in 1996 and shall be made only for those stocks for which the escapement goal review has been completed. In the event agreement cannot be reached about whether an escapement objective should or should not be used for the purpose of this section, the matter shall be referred promptly to a Conciliation Board to assist in resolving the dispute.

Stock Group	Criteria for Stock Group Concern	Escapement Indicator	Escapement Objective	Criteria for stock status[a]
North/Central British Columbia (NCBC) [b]	three or more stocks[b]	Yakoun Nass Skeena Rivers Inlet Smith	goal goal goal goal goal	spawning escapement below escapement goal for 3 consecutive years (taking into account terminal harvest management)
Upper Georgia Strait (UGS)	aggregate stock status	Devereux Kakwiekan Wakeman Kingcome Nimpkish Quinsam/ Campbell	aggregated goal for all systems combined	spawning escapement below goal for 3 consecutive years
Fraser Early (FRE)	two or more stocks	Middle Fraser Thompson Upper Fraser	goal goal goal	spawning escapement below goal for 3 consecutive years
West Coast Vancouver Island (WCVI)	aggregate stock status	Artlish Burman Gold Kauok Marble Tahsis Tashish	aggregated goal for all systems combined	spawning escapement below goal for 3 consecutive years
Columbia River Upriver Summer (CUS)	stock status	mid-Columbia	goal	spawning escapement below goal for 3 consecutive years
Columbia River Upriver Bright (URB)	status of Hanford reach stock, (consideration of Deschutes stock to be determined by later agreement)	Hanford Reach (Deschutes)	goal (goal)	spawning escapement below goal for 3 consecutive years

Washington Coastal Fall Chinook (WACO-F)	Two or more stocks	Grays Harbor Queets Hoh Quillayute	goal floor floor floor	For stocks with escapement goals, escapement below goal for 3 consecutive years. For stocks with floors, terminal adult run size below the following levels for 3 consecutive years: Queets - 4,166; Hoh - 2,000; Quillayute - 5,000.
Washington Coastal Spring/Summer Chinook (WACO-S)	Two or more stocks	Grays Harbor Quillayute sum Hoh sp/sum Queets sp/sum	goal goal floor floor	For stocks with escapement goals, escapement below goal for 3 consecutive years. For stocks with floors, terminal adult run size below the following levels for 3 consecutive years: Queets - 1,000; Hoh - 1,300.
Far North Migrating Oregon Coastal (FNOC)	aggregate stock status	Nehalem Miami Trask Kilchis Tillamook Siletz Yaquina Alsea Siuslaw Nestucca Wilson	density index of 60-90 spawners per mile.	average density index below 60 spawners per mile for 3 consecutive years.

[a] The use of a three consecutive year period for determination of stock status is premised on the assumption that action would be taken in the third year if the criteria were satisfied in the two previous years and there is a scientifically sound basis for expecting that the condition would recur in the third year.

[b] Area 6 and Area 8 escapement indicator stocks may be included in this group depending upon results of escapement goal reviews. If included, the criteria for stock group concern would increase to four or more stocks.

Attachment D

RISK ADJUSTMENT PROCEDURES FOR HATCHERY ADD-ONS IN PSC CHINOOK FISHERIES

BACKGROUND

The Pacific Salmon Treaty provides that "each region's catches will be allowed to increase above established ceilings based on demonstrations to the Commission and assessments by it of the specific contributions of each region's new enhancement activities, provided that the rebuilding schedule is not extended beyond 1998." In 1985 and subsequent years, the Commission established procedures for calculating hatchery add-ons.

These included a "risk adjustment" calculated from estimates of statistical variability in hatchery contribution estimates and subtracted from estimated hatchery contributions to determine the allowable hatchery add-ons. Since 1985 the risk adjustment has been calculated at a "1-in-20" level. This ensures that on average in only one year out of twenty will an over-estimate of the hatchery contributions large enough occur to result in the hatchery add-on being larger than the actual hatchery contribution. (Taking a hatchery add-on larger than the actual hatchery contribution would result in a base catch larger than the base catch ceiling or, in the context of an abundance based management regime, a harvest rate larger than intended on other stocks in need of conservation measures.)

STATEMENT OF INTENT

The purpose of this document is to establish agreed procedures for calculating future hatchery add-ons.

RISK ADJUSTMENT PROCEDURES

The following risk adjustment procedures shall be used for calculating hatchery add-ons for a region's fisheries:

1) During the first five years in which a hatchery add-on is taken, the risk adjustment shall be calculated at a 1-in-20 level to determine the allowable hatchery add-on.

2) Following the first five years, a risk adjustment will be required only when the risk adjustment, calculated at a 1-in-10 level, exceeds 7.5% of the intended harvest level, provided that a risk adjustment shall not be required after 1998 or after rebuilding objectives have been achieved, whichever is later.

HATCHERY ADD-ON REPORTING REQUIREMENTS

The managing agency for the region in which a hatchery add-on is taken shall provide the Commission with information necessary to assess specific contributions of enhancement activities and to determine allowable hatchery add-ons. Information necessary to calculate risk adjustments also shall be made available each year for which a risk adjustment is required.

Attachment E

TERMINAL EXCLUSIONS OF S.E. ALASKA CATCHES OF CHINOOK SALMON FROM THE SOUTHEAST ALASKA ALL-GEAR CHINOOKANNUAL HARVEST TARGET

BACKGROUND

The Commission established procedures to allow exclusion of chinook salmon catches in selected terminal fishing areas of north/central British Columbia from counting against that region's PST chinook catch ceiling beginning in 1989. These exclusions permit harvest of chinook surplus to spawning needs without disrupting domestic gear group allocations within the region which operates under an all-gear PST chinook annual harvest target. Consistent with the established procedures, the "base catch" of chinook in an exclusion area is included in the all-gear annual harvest target.

STATEMENT OF INTENT

The purpose of this document is to identify areas in Southeast Alaska where terminal exclusions are appropriate. In these areas, procedures previously adopted by the Commission for North/Cenral British Columbia terminal areas shall be applied to exclude certain catches from the general all-gear annual harvest target.

TERMINAL EXCLUSIONS FOR THE STIKINE AND TAKU RIVERS

Stikine and Taku chinook escapements are currently at or above goals and increases in catches are consistent with the goal of achieving optimum production. Exclusions will be allowed for Southeast Alaska fisheries operating in selected terminal areas of the transboundary Stikine and Taku rivers. Beginning in 1996, exclusions are needed to provide access to cooperatively enhanced transboundary sockeye salmon while ensuring that increased incidental chinook salmon catches do not disrupt allocations of the Southeast Alaska all-gear chinook annual harvest target to the various user groups. Following completion of rebuilding of these stocks, terminal exclusions will be allowed for the sport fishery consistent with these procedures.

Beginning in 1996, management strategies will be developed and implemented which provide U.S. fishermen access to cooperatively enhanced sockeye returns to the Stikine and Taku rivers. During the first two to three weeks of the drift gillnet season (which begins the third Sunday in June), early summer sockeye returns overlap the end of spring chinook returns. (Chinook-directed terminal gillnet fisheries have not been conducted during the TBR chinook rebuilding program.) Sockeye access management approaches will be developed, initially on an experimental basis, which allow increased targeting on sockeye while minimizing incidental catches of TBR chinook salmon.

Incidental chinook catches in terminal areas will be monitored and sampled to determine catches of TBR chinook salmon. These catches will be excluded from the Southeast Alaska all-gear annual harvest target using procedures previously adopted by the Commission for N/C British

Columbia terminal areas. Similarly, results will be reported to the Commission as part of the annual post-season fishery report.

TERMINAL EXCLUSION FOR THE YAKUTAT AREA FISHERIES

Set gill nets are used in Southeast Alaska exclusively in the Yakutat area. The majority of set gillnetting takes place inriver on local stocks but some takes place in marine waters. In recent years, the catch of chinook salmon in the inriver set gillnet fishery has greatly increased. The average inriver pre-Treaty set gillnet catch from 1975 through 1984 was 2,051. In 1994 and 1995, the catches were 3,523 and 9,006 respectively. After establishment of an escapement goal using spawner recruit data, returns from the Situk River are much greater than prior to the signing of the Treaty. These stocks are meeting scientifically established escapement goals.

For the Yakutat area set net fisheries identified above and consistent with Commission-established procedures, the base catch (inriver set gill net fisheries plus Situk inriver sport fishery, totalling 2,200) will be included within the SEAK chinook all-gear Treaty harvest target. Chinook harvests in excess of this base catch will be excluded from the all-gear Treaty annual harvest target.

TERMINAL EXCLUSION FOR THE HIDDEN FALLS HATCHERY TERMINAL AREA

The operators of the Hidden Falls hatchery (Northern Southeast Regional Aquaculture Association) have presented evidence to the Alaska Department of Fish and Game that there is a large underestimate of the number of chinook salmon produced by this facility. The Hidden Falls facility is located on Baranof Island approximately mid-way up Chatham Strait. There are no natural populations of chinook salmon within a large radius, the general area is used very little for fishing due to the absence of other salmon during the period of chinook availability.

The facility has historically produced large numbers of chum salmon for harvest by the purse seine fleet. In the early 1990's, it also began to produce large numbers of chinook smolts. In 1995, the first of serveral large expected returns occurred. The average harvest of chinook salmon during the purse seine fishery for chum was 500 fish from 1985 through 1992. In 1993 and 1994, the purse seine catches were 1,075 and 3,450 respectively. In 1995, the harvest was 21,400. However, cwt's could account only for 60% of the fish that returned there. This was also the first year that there was a successful experimental troll fishery at the facility. The percent of the catch that could be accounted for by tags in this troll catch was 79%. Many trollers stated that their catch was almost entirely composed of mature fish.

Since 1988, no tags have been recovered from 2 ocean chinook in any fishery in the terminal area that were from outside of Alaska.

Beginning in 1996, Alaska will exclude the chinook salmon harvest from the Hidden Falls terminal area for both purse seine and troll and provide a report to the commission on the fishery at the first meeting in 1997. For the Hidden Falls Hatchery terminal exclusion, a base catch of 500 chinook, consistent with the 1985 to 1992 average catch, will be included within the chinook SEAK all-gear Treaty annual harvest target.

Attachment F

CHINOOK STOCK ASSESSMENT AND MODELING

STATEMENT OF INTENT

The purpose of this document is to identify improvements to stock assessment capabilities and modeling tools, and to cooperatively seek the necessary funding to implement needed programs.

CHINOOK STOCK ASSESSMENT

A key ingredient to the signing of the Treaty was a recognition that sound management of the coastwide chinook resources required improved and expanded data collection programs. Assessment programs included such activities as stock identification programs, escapement monitoring and determination of age, sex and size compositions of catches and escapements. The Chinook Technical Committee has compiled a report that describes needed improvements to the coastwide stock assessment program ("Long Term Research Plans for Coastwide Pacific Chinook Stocks" TCCHinook (92-3)). The management agencies agree to review this report and prepare a funding proposal to implement the highest priority programs.

CHINOOK MODEL

The PSC chinook model has been used to assess fishing management alternatives and the status of stocks. Although there have been efforts to update the model, it is clear that additional improvements in modeling capabilities are feasible and desirable. A comprehensive review of the model's structure and approach is needed in light of current modeling technologies and procedures. In addition, output from the model needs to be compared and calibrated to actual fishery data. The CTC needs to develop a schedule by December 15, 1996 for undertaking and completing this work.

Attachment G

INCIDENTAL MORTALITIES OF CHINOOK SALMON

BACKGROUND

The movement of management jurisdictions toward abundance-based fisheries management encourages reconsideration of chinook non-retention (CNR) fishing mortality. The Commission previously agreed to report to the governments (by January 15, 1994) on, among other things, a program to "monitor and reduce incidental chinook mortalities on a coast-wide basis." To date, this program has not been developed. The following steps are intended to facilitate development of such a program and make additional progress toward reducing CNR mortalities.

STATEMENT OF INTENT

The purpose of this document is to establish a commitment to reduce incidental mortalities of chinook salmon by (1) utilizing opportunities provided by an abundance-based management approach, and (2) the identification and application of currently available fishery information pertinent to this purpose.

1. OPPORTUNITIES ARISING FROM ABUNDANCE-BASED MANAGEMENT

Adoption of multi-year, abundance based management regimes provides the opportunity to develop proposals for reducing CNR mortalities. Accordingly, the relevant management agencies shall develop specific options and implement viable proposals to reduce CNR mortalities to the extent practical.

2. OPPORTUNITIES ARISING FROM NEW INFORMATION

Substantial new information on incidental mortality has become available since the CTC conducted its initial review of such information in 1987. Methods used to estimate encounters also have changed for some fisheries since that time. To ensure that the Commission has the best available information on coastwide incidental mortalities, a thorough review of encounter rates and mortality rates should be conducted. The following process is suggested.

a. The Commission should request the following information from management agencies:

(i) a description of sources of incidental mortalities in fisheries, and factors contributing to incidental mortalities,

(ii) estimates of incidental mortalities, methods used to derive estimates, and limitations of estimates,

(iii) measures taken to reduce and minimize incidental mortalities since 1985,

(iv) measures which might be taken to further reduce incidental mortalities, and factors limiting actions which can be taken.

b. The CTC should review this information, incorporate the best available information for PSC use, and report to and advise the Commission and management agencies with a view to recommending further actions for their use.

c. The management jurisdictions should implement, to the extent feasible, the recommendations and report the results periodically to the Commission.

Attachment H

A PROCESS TO ADDRESS CONSERVATION NEEDS FOR CHINOOK SALMON STOCKS REQUIRING NON-HARVEST SECTOR MEASURES FOR REBUILDING

BACKGROUND

The Pacific Salmon Treaty (PST) implemented a coastwide rebuilding program to rebuild depressed natural chinook salmon stocks. The rebuilding program established regimes for fisheries which, when combined with restrictions on harvest impacts imposed by management agencies, will rebuild natural stocks. So far, success has been variable; in some cases, harvest management measures alone do not address the fundamental causes of the depressed condition of the stocks. In these cases, achieving optimum production will require additional measures outside the harvest sector. Presently, however, the PSC has little or no ability to support efforts to address non-harvest sector sources of mortality or production constraints that affect the likelihood of successfully restoring such stocks.

STATEMENT OF INTENT

The purpose of this document is to define a process for the Pacific Salmon Commission (PSC) to more effectively address constraints on restoring production associated with non-harvest sector impacts, such as habitat.

SUGGESTED APPROACH

The following process is proposed as the means for the PSC to (1) identify stocks for which harvest management alone cannot restore production of the stock; (2) convey to relevant management agencies the PSC's harvest regime and the necessity for additional actions; (3) solicit information from the management agencies on measures being planned and taken to address these actions; (4) identify ways the PSC and management agencies can support their respective conservation efforts.

STEP 1: IDENTIFY STOCKS OF CONCERN

The PSC Chinook Technical Committee (CTC) should develop a list of stocks of concern. These are stocks either projected by the CTC chinook model as not rebuilding, are categorized by the CTC rebuilding assessment criteria as "not rebuilding" or "probably not rebuilding" (considering the applicable coastwide fishing regimes), or not producing consistent with historic levels of production. Stocks categorized as indeterminate can be designated stocks of concern based on special considerations of production trends (e.g., stocks with spawning escapements significantly below MSY levels or exhibiting trends not consistent with natural stock fluctuations). In constructing this list, groups of stocks with similar life history/migratory patterns which are represented by one or more indicator stocks should be identified.

STEP 2: INFORM RELEVANT MANAGEMENT AGENCIES ABOUT THE PSC'S CONSERVATION PROGRAM AND THAT ADDITIONAL ACTIONS (GUIDED BY A RESTORATION PLAN) ARE NECESSARY

To the extent a restoration plan does not exist or is not in process, the Commission should, to the extent possible, serve as a catalyst for such a plan. The Commission or its national sections should make recommendations through the respective governments in support of necessary measures, including administrative changes, policy direction, and funding.

STEP 3: IDENTIFY AND IMPLEMENT WAYS THE PSC AND MANAGEMENT AGENCIES CAN SUPPORT THEIR RESPECTIVE CONSERVATION EFFORTS

STEP 4: ANNUALLY MONITOR PROGRESS

The CTCwill include in its annual report a periodic synopsis of measures taken by the appropriate management jurisdiction(s), and report to the Commission on the progress toward restoring production of stocks of concern.

Attachment I

A PACIFIC SALMON COMMISSION PROCESS TO ADDRESS THE OPTIMUM PRODUCTION OF CHINOOK SALMON

BACKGROUND

The focus of the Commission's activities to date has been on monitoring and developing fishing regimes that meet conservation objectives. Meeting the obligation of providing for optimum production will require a specific action plan incorporating specific long term objectives and a process with short-term milestones to ensure progress. This optimum production process would complement and affirm the desire of the Parties "to cooperate in the management, research and enhancement of Pacific salmon stocks."

STATEMENT OF INTENT

The purpose of this document is to help implement the Treaty's committment to optimum production of chinook salmon through the protection, restoration and enhancement of Pacific salmon.

APPROACH

The Joint Objectives and Goals process should be used to develop coordinated plans to increase production through habitat improvement and restoration, supplementation, and enhancement of salmon stocks.

Enhancement can be a useful tool in addressing the rebuilding of stocks and in providing harvest opportunities towards the objective of optimizing production. The Joint Objective and Goals reports developed in 1991/92, along with the annual enhancement reports exchanged by the parties, provides a starting point for further action through the Commission.

The Parties should identify and pursue opportunities for increased production consistent with the Treaty's optimum production goal through the restoration, supplementation or enhancement of salmon stocks and habitat improvement and restoration. The JOG process should be used to ensure a coordinated approach to enhancement as called for by the Treaty. The Commission should establish an annual time schedule for developing recommendations for actions to increase production. The Panels should be instructed to develop recommendations for consideration by the Commission. The initial list should include specific actions within each major region to meet Treaty objectives. The development of actions to restore, supplement or enhance salmon stocks is intended to be an ongoing process, with additional actions being identified on an annual basis for consideration through the process described above. Domestic funding strategies will be necessary to ensure the implementation of recommended measures.